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Multivariate analysis of the effect of income inequality on health, social capital, and happiness

Beatrice d'Hombres,
Leandro Elia,
Anke Weber

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Contact information

Beatrice d'Hombres
Address: Unit of Econometrics and Applied Statistics, Joint Research Centre, European Commission, Ispra, IT.
E-mail: beatrice.d'hombres@jrc.ec.europa.eu
Tel:+39 0 332 78 3537

Leandro Elia
Address: Unit of Econometrics and Applied Statistics, Joint Research Centre, European Commission, Ispra, IT.
E-mail: leandro.elia@jrc.ec.europa.eu
Tel:+39 0 332 78 3077

Anke Weber
Address: Unit of Econometrics and Applied Statistics, Joint Research Centre, European Commission, Ispra, IT.
E-mail: anke.weber@jrc.ec.europa.eu
Tel:+39 0 332 78 5821

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Executive Summary:

The last two decades have seen a growing concern about rising inequality. In a recent book (2012), Economics Nobel laureate Joseph Stiglitz argues that rising income inequality is one of the main factors underlying the economic and financial crisis in the United States. Wilkinson and Pickett (2009) similarly assert that higher inequality has harmful social consequences. This trend of growing inequality has furthermore been condemned in public arenas, where protests in the United States (the "Occupy Wall Street" movement) and in Spain (the "indignados") show the extent of widespread public dissatisfaction with the present system which is denounced as being fundamentally flawed and unfair. The "We are the 99%" slogan and the associated web blog "We are the 99 percent" are direct references to this growing unequal distribution of wealth. A common rallying point of these movements is the argument that bankers who have benefited from large bonuses have been protected by bailout measures, while the victims of the crisis brought on by these very same bankers are faced with the reality of rising unemployment. This has also recently led the EU to agree on capping bonuses to bankers.

Within this context, the European Commission[1] decided last year to undertake a comprehensive study on the social and economic challenges associated with rising income inequality in Europe. This report constitutes the third deliverable of this global study. The first report includes a literature review on the relationship between income inequality and social outcome variables in the areas of happiness, criminality, health, social capital, education, voting behavior and female labor participation (d'Hombres, Weber, & Elia, 2012). The second report complements the literature review by examining the bivariate correlations on NUTS1 level between income inequality and the social outcomes mentioned above (Elia, d'Hombres, Weber, & Saltelli, 2013). However, since the analysis in the second report relied on bivariate correlations, none of the statistical associations could be regarded as evidence of a causal relationship. In this third report, we carry out a multivariate analysis on a selected number of social outcomes while controlling for a multitude of individual and country level specificities. The social

[1] Joint cooperation between the Directorate General Joint Research Centre (DG JRC) and the Directorate General for Employment, Social Affairs and Inclusion (DG EMPL)

outcomes are **social capital**, i.e. trust and participation in organizations, **happiness** and **health**.

This study suggests that the adverse effect of income inequality on a plurality of societal development challenges as proposed by Wilkinson and Pickett (2009) **cannot be confirmed by the data, except for the case of trust**. In particular, our analysis cannot confirm the hypothesis of a strong and significant effect of income inequality on health, happiness and participation in associational activities.

However, we show that income inequality has a potential damaging effect on trust in Europe. A negative association between income disparities and generalized trust is reported in all estimations presented in this report. Though these findings need to be considered with care given that they might be specific to the countries sampled or the time period covered, the implication of a significant effect of inequality on trust should not be discounted. According to a variety of scholars, trust is critical for the functioning of societies (Putnam, 2000). Social capital and **trust** are factors which are linked to cooperative behaviors and investment decisions as well as to the quality of institutions, which in turn are all key factors of **economic performance** (Knack and Keefer, 1996, and Guiso et al 2004).

1. Introduction

The last two decades have been marked by a growing concern about rising inequality. In a recent book (2012), Economics Nobel laureate Joseph Stiglitz argues that rising income inequality is one of the main factors underlying the economic and financial crisis in the United States. In October 2012, The *Economist* magazine has also devoted a special report on income inequality in the world.[2]

The growing inequality has also been condemned in public arenas. Protesters in the United States (the Occupy Wall Street movement) and in Spain (the indignados) have denounced the present system as fundamentally flawed and unfair. The "We are the 99%" slogan and the associated web blog "We are the 99 percent" (see http://wearethe99percent.tumblr.com/) also refer to this growing unequal distribution of wealth. A common rallying point of these movements is the argument that bankers who have benefited from large bonuses have been protected by bailout measures, while the victims of the crisis brought about on by these very same bankers are faced with the reality of rising unemployment. This has also recently led the EU to agree on capping bonuses to bankers.

The development of income inequality in the EU Member States has been the subject of a recent publication by the OECD (2011). The report highlights a general trend of widening income disparities. While in the 1980s the Gini coefficient was equal to around 0.29 in OECD countries it markedly rose to 0.32 in the late 2000s. Particularly striking is the increase in income inequality of former equal societies, such as the Nordic countries and Germany. The causes of this rising income inequality in the past decades have also attracted much political and scholarly attention. The OECD (2011) report provides a wealth of explanatory mechanisms, ranging from rising wage inequality to different taxation policies and household structures.

A different perspective is to look at the social and economic challenges associated with rising income inequalities in the EU, i.e. to ask whether and why we should pay attention

[2] See http://www.economist.com/node/21564414 for additional information.

to the growing polarization between the 1% and the 99% of the population. These questions gained prominence through a widely cited book by Richard Wilkinson and Kate Pickett entitled "The Spirit Level, Why More Equal Societies Almost Always Do Better" (2009). Although the authors main tenet that more equal societies perform better on a wide range of social outcomes is intuitive and straightforward, the empirical tests are based on bivariate correlations at national level, implying that the authors fail to control for other numerous factors, which might have had an impact on both the social outcomes and income inequality.[3] The empirical associations reported in their book might thus lead to misleading causal inferences.

The book of Wilkinson and Pickett, which attracted a lot of attention, called for a more careful analysis of the consequences of rising income inequality. Last year, the European Commission[4] thus decided to undertake a comprehensive study on the social and economic challenges associated with rising income inequality in Europe. The present report is the third and last outcome of this study. The first report includes a literature review on the relationship between income inequality and social outcome variables in the area of happiness, criminality, health, social capital, education, voting behavior and female labor participation (d'Hombres, Weber, & Elia, 2012). The second report complements the literature review by examining the bivariate correlations on NUTS1 level between income inequality and the social outcomes mentioned above (Elia, d'Hombres, Weber, & Saltelli, 2013). This report shows that, in Europe and at NUTS1 level, we observe significant bivariate correlations between higher income inequality and (i) lower recorded voter turnout, (ii) lower participation in voluntary organizations, (iii) higher crime rates, (iv) higher early school leaver rates, (v) lower level of trust and (vi) self-reported voting behaviors. Conversely, the social outcomes related to well-being and health were found not to be significantly associated with income disparities. However, since this analysis relied on bivariate correlations none of the statistical associations could be regarded as evidence of a causal relationship. In this third report, we carry out a

[3] See http://www.equalitytrust.org.uk/resources/ for a list of refutations and counter-refutations linked to the empirical analysis.
[4] Joint cooperation between the Directorate General Joint Research Centre (DG JRC) and the Directorate General for Employment, Social Affairs and Inclusion (DG EMPL)

multivariate analysis on a selected number of social outcomes while controlling for a multitude of individual and country level specificities. The social outcomes studied in this report are **health**, **social capital**, i.e. trust and participation in organizations, and **happiness**.

The report is organized as follows. Chapter 2 describes the estimation method and the data employed for the empirical investigations. Chapters 3, 4 and 5 constitute the core of the report and present the multivariate analyses of the effect of income inequality on social capital, happiness and health respectively. We first discuss the expected effect of income inequality on the social outcome under scrutiny and review the relevant empirical literature. After having explained how the empirical analysis has been carried out, we then present our main findings. Finally, we check the robustness of the results in relation to the underlying sample sizes and estimation strategies. Chapter 6 concludes the report.

Our results refute most of Wilkinson and Pickett's (2009) argument that there is a clear, robust and strong impact of income inequality on various social outcomes. In particular, health, happiness and participation in associational activities do not seem to be significantly associated with income inequality in a multivariate context. These results are robust to the inclusion of a large number of individual and country-specific variables and different estimation strategies. While there are very good reasons to be worried about growing income inequality, the data does not provide support for a direct relationship between income inequality and these social outcomes. Certainly, income inequality is correlated with several other country characteristics, which once taken into account fade away the associations reported in Wilkinson and Pickett (2009). However, the empirical analysis presented in this report suggests that, in Europe, income inequality has a detrimental effect on the level of generalized trust. This association seems to be robust to the inclusion of a wide range of control variables and estimation methods. If, as argued by Kenneth Arrow (1972, p 357), "it can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence", there are all the reasons to be concerned with the negative association reported in this report between income inequality and trust, letting even apart the social justice motivations behind the fight against growing disparities.

2. Methodology and data source

2.1 Data sources

To carry out the empirical analysis presented in this report, we have matched data from five different sources. First, we rely on the *European Values Study* (EVS) to measure the social outcomes (except the life expectancy indicator) and all individual level variables used in the estimations.

Table 2.1: Countries participation to EVS

Country	1981-1984	1990-1993	1999-2001	2008-2010
Austria		*	*	*
Belgium	*	*	*	*
Bulgaria		*	*	*
Czech Republic		*	*	*
Cyprus				*
Denmark	*	*	*	*
Estonia		*	*	*
Finland		*	*	*
France	*	*	*	*
Germany	*	*	*	*
Great Britain	*	*	*	*
Greece			*	*
Hungary		*	*	*
Iceland	*	*	*	*
Ireland	*	*	*	*
Italy	*	*	*	*
Latvia		*	*	*
Lithuania		*	*	*
Luxembourg			*	*
Malta	*	*	*	*
Netherlands	*	*	*	*
Poland		*	*	*
Portugal		*	*	*
Romania		*	*	*
Slovak Republic		*	*	*
Slovenia		*	*	*
Spain	*	*	*	*
Sweden	*	*	*	*

Note: Countries participation to a specific EVS wave are denoted by an asterisk.

The EVS was first launched in 1981, with the field work taking place over the period 1981-1983. Three additional waves followed, respectively in 1990, 1999 and 2008. For these three waves, the field work was implemented respectively over the period 1990-1993, 1999-2001 and 2008-2010. In Table 2.1, we report the EU countries participating to each wave of the EVS. Eleven European countries participated to the first wave while 24 and 26 were part of respectively the second and third waves. Finally, all EU countries are included in the last wave of the EVS. The EVS is a large scale, cross country and repeated survey that provides information on the socioeconomic characteristics, ideas, beliefs, preferences, attitudes, values and opinions of citizens of the persons interviewed. The average country sample size is approximately 1500. In each country the sample is representative of the adult population of 18 years and older who are resident within private households, regardless of nationality and citizenship or language.[5]

Second, we employ the *World Development Indicators* (WDI) and the *World Economic Outlook Database* (WEO) to gather country-specific information. The WDI database includes more than 1,000 indicators for 216 economies, with long time series going back to 1960 while the WEO is focused on macroeconomic data series with data available since 1980 for 180 countries.[6] When an indicator used in the empirical analysis is available in both datasets, we have selected the one from the WEO as this database contains less missing values than the WDI. The 27 EU countries are covered by both datasets, though with some missing data. Note that one indicator used in the empirical analysis has been also taken from *OECD Health Data* (OECD, 2012).[7]

Finally, our measure of income disparity - the GINI coefficient - is taken from the *World Income Inequality Database* (WIID) provided by the United Nations University – World Institute for Development Economics Research. The updated data of the Deininger and Squire (1996) from World Bank, the unit record data of the Luxembourg Income Study,

[5] In Finland the sample is representative of the 18-74 years old population. See http://www.europeanvaluesstudy.eu/ for detailed information.

[6] See http://data.worldbank.org/data-catalog/world-development-indicators and http://www.imf.org/external/pubs/ft/weo/2013/01/weodata/index.aspx for additional information.

[7] See http://www.oecd.org/health/health-systems/oecdhealthdata2012.htm for additional information.

the Transmonee data by UNICEF/ICDC, Central Statistical Offices and research studies are the main sources of the WIID. The WIID database, which collects information on income inequality for developed, developing and transition countries, currently offers the widest time series data coverage at the country level. In the empirical analysis, we rely on the WIID data for measuring the GINI coefficient from the second half of the seventies until 1998 while for the recent period we have used data from the *European Statistical Office*, EUROSTAT.

2.2 Income inequality

2.2.1 Measurement issues

The WIID dataset reports two measures of the Gini coefficient. The first measure is calculated using methods developed by Shorrocks and Wan (2008) and consists in derivating the Gini coefficient using data on income deciles while the second measure is the one originally reported by the source. The high correlation of 0.99 between the two GINI coefficients suggests that both measures are substitutable. In the present analysis we rely on the first measure since it has a better coverage both in terms of countries and time periods.

The WIID data also reports several versions of the Gini index for the same country-year pair, depending on the *coverage* of the surveys underlying the observations, the *income reference unit*, the *equivalence scale*, or the *income definition* employed. More than 90% of the surveys used for computing the Gini coefficient use samples of the whole population while the 10% remaining are based on sub samples of the population (e.g. workers). The reference unit is either the household (85% of cases) or the individual (15% of cases). While the population coverage of the surveys and the reference unit do not seem to pose particular problems, the income concept and the equivalence scale, on the other hand, have a substantial impact on the Gini measure. In particular, the Gini index varies according to the following income definitions: disposable income, monetary disposable income, gross income, monetary gross income, net and gross earnings,

consumption and expenditure.[8] In addition, when the reference unit is the household, the income measure can be adjusted or not adjusted (i.e. not equivalised) to take into account the difference in relative need of households of varying sizes. When adjusted, the following equivalence scales can be used: the household size, the square root of the household size, the OECD scale, the OECD-modified scale and for some countries a specific national scale is applied (e.g. the UK uses the HBAI scale produced by the Department for Work and Pensions). Unfortunately it is not possible to use a general routine to sort the data, since the presence of missing values prevents us from choosing an income definition (or equivalence scale), which would provide us with comparable figures between and/or within country.

In order to have one data entry for every country-year observation, we had to select one observation for those cases of multiple entries. We have applied a "pragmatic" algorithm, which works as follows: we first select observations computed on disposable income; if this information is not available we thus choose Gini coefficients based on either monetary disposable income or gross income, otherwise we takes the Gini measures calculated on earnings. As a result, we end up with a sample wherein 83% of the observations are computed by using disposable income, 5% gross income, 2% monetary disposable income, 6% gross earning and 4 % by using different income definitions. As for the equivalence scale, the method aims, as far as possible, at selecting country observations that make use of the same equivalence scale for the computation of the Gini over the different periods.

All data on income inequality for the post-1996 taken from EUROSTAT are equivalised using the OECD-modified scale. This implies that the 2 data points per country corresponding to the two EVS waves having taken place after 1996, are based on the same equivalence scale. In the previous period (i.e. the first two income inequality measures linked to the first 2 EVS waves), data are less consistent: 35 % of the GINI measures are equivalised by dividing the household income by the number of household's member, 40% of the observations come with no adjustment and 25% use a

[8] For more detailed information about the income concept, see UNU-WIDER (2013).

national scale. The two income inequality measures per country corresponding to the two EVS waves having taken place before 1993 have been selected in such a way as to maximize the likelihood for a given country to have income inequality data based on the same equivalence scale over these 2 periods. We are however aware that using inequality values, which have been calculated by using different equivalence scales, might render country comparisons problematic. However, as suggested by the sensitivity analysis reported in Burniaux et al. (1998), while the level and, in particular, the composition of income inequality are affected by the use of different equivalence scales, trends over time and rankings across countries are much less affected. Furthermore, we have included in the empirical analysis $Break$ dummies in order to specifically control for shifts in equivalence scales and income. In this way, we should purge the Gini coefficients of the variation created by these changes in its measurements.

2.3 Descriptive analysis

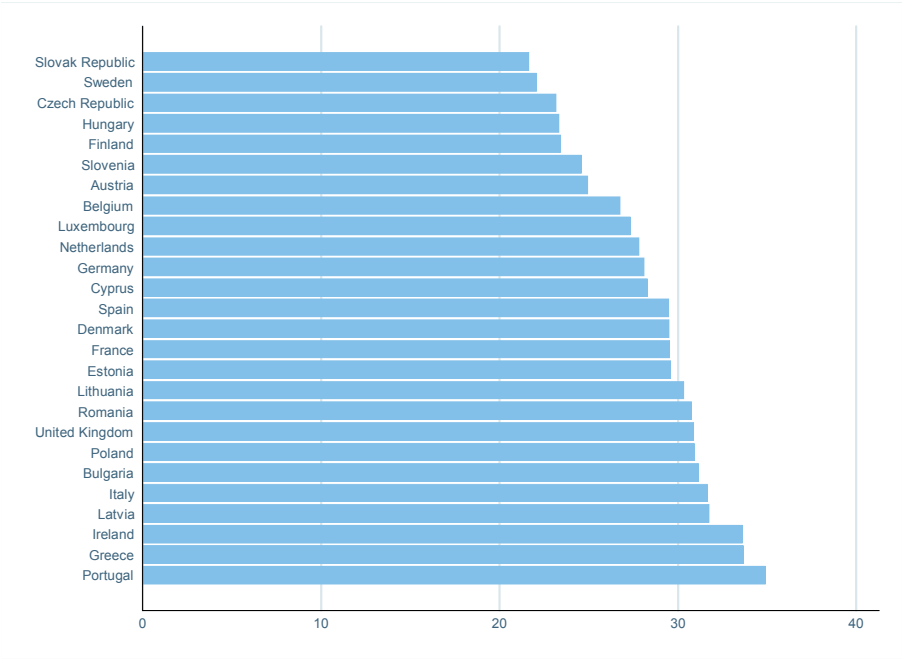
Before embarking on the analysis of the impact of income inequality on the three social outcomes, i.e. health, social capital and happiness, we present some descriptive analysis of our measure of income inequality, i.e. the Gini coefficient. In particular, we will assess the variability of the Gini along two dimensions: (1) over the EU member states and (2) over time.

Figure 2.1 displays the country average Gini coefficient for 26 European member states over the period 1981-2009. There exists a substantial variation across countries, with Slovak Republic exhibiting the lowest levels of income inequality and Portugal displaying the highest levels. Nordic countries as Sweden and Finland, which have traditionally a more generous welfare system, hold the top positions, i.e. they are more equal, with an average value of the Gini equal respectively to 22 and 23. Mediterranean countries along with some Eastern countries rank very lowly, with Gini values ranging between 30 and 35.

Table 2 depicts the evolution of the Gini coefficient over the 4 periods covered by the EVS. In the first two periods covered by the EVS we observe a rise in income inequality

in Germany and the Netherlands. The United Kingdom is also characterized by a marked surge in the value of the Gini coefficient. On contrary, France or Italy show a reduction in the level of income disparities in the 80s

Figure 2.1: Country average Gini coefficient over the period 1981-2009 (0-100)



Source: World Income Inequality Database and European Statistical Office, EUROSTAT

Table 2: Evolution over time of the Gini coefficient

Country	1981-1984	1990-1993	1999-2001	2008-2010
Austria	.	22.70[d]	26.00	26.20
Belgium	28.20[b]	23.40[e]	29.00	26.40
Bulgaria	.	23.30[f]	34.35[g]	35.90
Cyprus	.	.	.	28.30
Czech Republic		22.20	22.63[g]	24.70
Denmark	41.27[c]	30.70[f]	21.00	25.10
Estonia	.	24.00	33.98[g]	30.90
Finland	.	20.40[f]	24.00	25.90
France	31.40	28.00	29.00	29.80
Germany	28.00	29.30[f]	25.00	30.20
Greece	.	.	34.00	33.40
Hungary	.	20.32	24.49[g]	25.20
Ireland	36.60[c]	36.00[d]	32.00	29.90
Italy	33.00	32.20[f]	30.00	31.50
Latvia	.	24.00	33.60[g]	37.70
Lithuania	.	24.80	32.26[g]	34.00
Luxembourg	.	.	27.00	27.70
Netherlands	28.10[a]	29.60[f]	26.00	27.60
Poland	.	26.80[f]	33.99[g]	32.00
Portugal	.	32.90	36.00	35.80
Romania	.	26.20	30.16[g]	36.00
Slovak Republic		18.00	23.22[g]	23.70
Slovenia	.	25.90	24.52[g]	23.40

Spain	26.90[c]	26.80[f]	33.00	31.30
Sweden	19.40	.	22.00	24.80
United Kingdom	25.70	33.50	32.00	32.40

Source: World Income Inequality Database and European Statistical Office, EUROSTAT.
Note:[a] 1977; [b] 1979; [c] 1980; [d] 1987; [e] 1988; [f] 1989; [g] 1997.

A less clear pattern emerges for the period going from 1999 to 2010. For two third of the countries, the Gini index displays an increasing time trend, while the opposite occurs for the remaining countries with Latvia and Romania recording the largest increases in inequality.

3. The impact of income inequality on social capital

3.1. The rationale

The term social capital is often traced back to the work of the sociologist Bourdieu (1977), but it gained popularity with the seminal work of Coleman (1990) and Putnam (1993). Recently, Guiso et al. (2008) define social capital as "good" culture—i.e., a set of beliefs and values that facilitate cooperation among the members. The authors show that social capital can be measured by both direct indicators (such as generalized trust) and indirect indicators (such as membership or blood donations).

There is a large consensus that heterogeneity is one important factor reducing the formation of social capital. Usually, community heterogeneity refers to income inequality but also ethnicity, and racial heterogeneity, though here, our interest is more specifically on economic inequality. Several mechanisms could explain the association between economic inequality and social capital. First, individuals might be adverse to heterogeneity. In other words, they prefer having contacts with individuals that are similar to themselves, i.e. that belong to the same socioeconomic group. In heterogeneous societies contacts between dissimilar individuals will be at a lower rate than in more homogeneous societies. Repeated interactions being conducive of social capital and trust, heterogeneous societies are thus characterized by fewer contacts and, in consequence, by lower levels of cooperation and trust (see the seminal works by Colman, 1990, and Alesina et al, 2002 for instance). This aversion to heterogeneity can be driven by the fact that individuals from different socioeconomic groups are less likely to share common values and norms which makes it more difficult for them to predict the attitudes of others. This creates an environment not favorable to the development of social capital (Knack and Keefer, 1997). Second, when resources are not evenly distributed, poor individuals might perceive that they are living in an unfair society where the rich tend to exploit the poor. This would lead low-income individuals to develop distrust against richer individuals (Rothstein and Uslaner, 2005). Uslaner and Brown (2005) argue that when income inequality is high, individuals from different socioeconomic groups would have the sensation that they are not sharing the same fate, and this would hamper trust. Third,

inequality should relate to the level of optimism. A higher level of inequality is likely to reduce the level of optimism for the future and thereby trust (Uslaner and Brown, 2005, Rothstein and Uslaner, 2005).

3.2. Existing empirical evidence

Empirical studies on the relationship between heterogeneity and the level of social capital are of three types. Cross-country papers explore either the association at the aggregated level between income inequality and social capital or combine individual-level data on social capital with country-level information on economic inequality. Studies on single countries pool information on income inequality at the subnational level with individual level information on social capital.

3.2.1 Cross-country studies

Most of the cross-country studies conclude that when income inequality is high, social capital tends to be stunted (Knack and Keefer, 1997, Leigh, 2006a, Fisher and Torgler, 2006, Berggren and Jordhal, 2007, Bjornskov, 2006).

Based on aggregated country-level data drawn from the World Values Surveys, cross-country estimates reported in Knack and Keefer (1997) show that income inequality is negatively and significantly related to trust and civic cooperation. The empirical analysis is based on 29 market countries, and several country-level controls are included in the estimates.

Contrary to the studies mentioned above, Leigh (2006a) explores the relationship between social capital and income inequality by combining individual data drawn from the World Values Surveys in 59 countries with country measure of income dispersion. The author finds that both income inequality and ethnic heterogeneity are negatively associated with trust but that the effect of the former dominates the latter's one. The results hold even after taking into account the reciprocal relationship between income

inequality and social capital.[9] Using also the World Value Surveys, cross-country estimates in Berggren and Jordhal (2006) confirm these findings. Fisher and Torgler (2006) also working with individual data on trust for 25 countries observe that trust is positively associated with a person's relative income position as measured by the difference between a respondent's income and the national (or regional) income.

While all the papers mentioned above find a strong negative association between social capital and economic inequality, Steijn and Lancee (2011), on the contrary, conclude that income inequality and perceived inequality do not correlate with trust once country wealth is controlled for. Additionally, Lancee and Van de Werfhorst (2011) examine the effect of income inequality in EU countries on various forms of social capital capturing social, civic and cultural participation. The empirical work is based on the 2006 EU-SILC survey and demonstrates that though civic participation is significantly associated with economic inequality social and cultural participation are not.

3.2.2 Single-country studies

Research based on a single country generally relies on a multilevel approach. Social capital is measured at the individual level and explained by both individual socioeconomic characteristics (age, educational attainment, income, gender, etc) and the social context in which the respondents are living (in particular, the level of community heterogeneity). This social context is defined at the municipal/neighborhood level (Alesina and La Ferrara, 2000, 2002, Leigh, 2006a, Costas and Kahn, 2003, Coffe and Geys, 2006, Gustavsson and Jordhal, 2008).

A significant literature has documented the negative effect of community heterogeneity on social capital across metropolitan areas in the US. Alesina and La Ferrara (2000 and 2002) use cross-sectional data from the US General Social Surveys over the period 1974-1994 to examine the effect of community heterogeneity on membership and trust. After

[9] To account for the reciprocal relationship between income inequality and social capital, the author instruments income inequality with the ratio of the size of the cohort aged between 40 and 59 to the population aged 15 to 69.

having controlled for individual and some community characteristics as well as for year and state-fixed effects, the authors find that respondents living in more racially fragmented and income unequal communities report lower levels of social capital. However, the effect of racial heterogeneity is even stronger and income inequality has no longer a significant effect on trust when this variable is added to the empirical model. Costas and Kahn (2003) also observe a negative impact of community heterogeneity on various measures of social capital (volunteering and membership in organizations), once they control for individual characteristics as well as for time and regional dummies. However, in contrast to Alesina and La Ferrara (2000 and 2002) their results suggest that the crucial determinant of volunteering and membership in organizations is income inequality.[10,11] Tesei (2011), using the decomposability of the Theil index, shows that what really matters is income inequality between racial groups. While racial fragmentation and economic inequality are both significantly associated with trust and group participation, these effects become insignificant when income inequality between racial groups is accounted for.

Solid empirical evidence on the relationship between social capital and income inequality outside the US are quite limited. Leigh (2006b) analyzes the determinants of localized trust (trusting those living in the same neighborhoods) and generalized trust (trusting those who live in the same country) in Australia using individual data over the period 1997-1998 combined with information on the neighborhood in which the respondents are living. Results suggest that there is not an apparent relationship between inequality and trust and this finding remains identical when the author accounts for the possible "endogeneity" of income inequality. Coffe and Geys (2006) explore the effect of income inequality on the municipality level of social capital in 307 Flemish municipalities in 2000. The authors rely on three indicators measuring social capital in a broad sense: associational life, electoral participation and crime rate that are combined into a single index using a principal component analysis. After having controlled for several

[10] Costas and Kahn (2003) also find that the increase in the participation of women on the labour market is the main responsible for the decline in social capital produced inside home (entertaining friends and relatives).

[11] Note that when the authors correct for the endogeneity of income inequality in the volunteering equation, the coefficients associated with income inequality becomes insignificant.

socioeconomic characteristics of the municipality, the authors do not observe any effect of income inequality on social capital. On contrary, ethnic heterogeneity has a depressing effect on social capital.

Finally, Gustavsson and Jordhal (2008) combine Swedish individual-level panel data (1994-1998) on trust with county level measures of inequality. The results suggest that different measures of income inequality lead to different conclusions. The Gini coefficient is weakly related to trust while the ratio of the 50th over the 10th percentile income displays a negative and significant association with trust suggesting that differences in the bottom half of the income distribution matter most for explaining trust. Compared to Alesina and La Ferrara (2000, 2002), Leigh (2006b) or Costas and Kahn (2003), the panel data employed in this study allows for controlling for time-invariant individual and county characteristics in addition to the conventional time-varying individual covariates, implying that the estimated association between social capital and income inequality is very likely to be a causal one.

In conclusion, macro studies usually conclude that income inequality depresses social capital while micro studies seem to produce more contrasted results (see Table 4.1 for an overview of the studies). However macro studies are sometimes problematic when it comes to making causal statements. Indeed, this body of literature is mainly grounded on cross-sectional data (i.e., one point per country), meaning that it is not possible to control for all potential time-invariant country specific-effects (and thus to look at the effect, *within a* country, of income inequality changes on social capital formation). Single country based studies have the main advantage of keeping constant country-specific determinants of trust which are susceptible to bias cross-country estimates if they are not controlled for.[12] Micro studies produce more contrasted results than macro analyses. In the USA, there seems to be a robust negative association between community heterogeneity and social capital. Findings for other countries are less conclusive.

[12] Furthermore, while income inequality measures used for cross-comparisons are subject to measurement comparability issues, this is less the case when one relies on income inequality measures of different geographical units within a given country.

While the empirical analysis presented in this chapter examines the relationship between income inequality and social capital in a cross-country context, contrary to the aforementioned macro studies, a longer time period (1981-2008) is covered and the time-invariant country heterogeneity is accounted for.

Table 3.1: Studies on income inequality and social capital

Author	Data	Inequality measure (INE) Main outcome (O)	Method	Results
Alesina and La Ferrara (2002)	USA 1974-1994	INE : Gini measured at the local level etropolitan areas) O: Trust	Control for individual and communities character plus state and year dummies DFbeta method to control for outliers	Respondents living in more fragmented and income unequal communities report lower level of trust Effect of income inequality no longer significant when racial heterogeneity is controlled for
Alesina and La Ferrara, (2000)	USA 1974-1994	INE: Gini measured at the local level (metropolitan areas) O: Membership rate	Inclusion of individual and community covariates plus state and time dummies DFbetas method-IV estimates	People living in more unequal communities are less likely to join groups, even after controlling for racial fragmentation
Knack and Keefer (1997)	Cross-country 1981and 1990/1991 29 market economies	INE :Gini coefficient O: Trust and civic cooperation	Cross country estimates (one point in time), including country covariates	Trust and civic norms are stronger in nations with higher and more equal incomes
Gustavsson and Jordahl (2008)	Sweden, 1994-1998	INE : Gini, 90/10, 90/50, 50/10 ratios O: Trust Individual data in panel combined with county specific information	Controls include county and individual fixed effects, time dummies and time-varying individual covariates OLS and IV estimates	Gini coefficient weakly related to trust while the ratio p50-10 is negatively and significantly related to trust. Differences in the bottom half in the income distribution matter for trust. The effect of income inequality is primarily observed for people with a strong aversion against income inequality
Leigh, (2006 a)	Cross-country: 59 countries (1999/2000 and 1995/1997)	INE :Gini O: Trust	OLS Estimates at the (i) country level and (ii) individual level IV estimates with inequality instrumented by the relative size of a country's mature age cohort	Country income inequality is negatively and significantly associated with country level of trust
Leigh, (2006 b)	Australia, 1997-1998	INE: Gini O:"generalized" and "localized" trust	Probit and IV estimates on individual data with income inequality measured at the neighbourhood-level and individual controls	Income inequality at the neighborhood level is not significantly associated with individual trust. It is racial fragmentation that matters.
Coffe and Geys, 2006	Belgium, 2000	INE: Ratio of the interquartile difference in income (Q3-Q1) to the median income level O: (i) Electoral turnout in 2000 at municipal elections, (ii) density of associational activity, (iii) crime rate per capita. The 3 SC indicators are combined together.	Cross -sectional (307 municipalities) OSL and interval estimates Several control for the socioeconomic characteristics of the municipality Explanatory variables lagged one year	Income inequality is not significantly correlated with the municipality's level of social capital.
Costa and Kahn (2003)	USA, period coverage varying (between 1972 and 1998)	INE: Gini (measured at the municipal level) O: Social capital produced outside home: trust, volunteering, membership, social capital produced inside home: entertaining,	Probit estimates Controls include individual character, survey and regional dummies, in addition to the variables measuring community heterogeneity.	Rising community heterogeneity, and in particular income inequality, is negatively and significantly related to social capital

		meeting friends	IV estimates also presented for the determinants of volunteering	
Berggren and Jordhal (2006)	Cross-country , 24 countries 1995 or 2000	INE: Gini O:Trust	Cross -country estimates Include country-level covariates	Rising income inequality is associated with lower trust
Fischer and Torgler (2006)	Cross-country, 25 countries 1998	INE: Relative income position O: Generalized trust and trust in institutions	Cross country estimates based on individual data Probit estimates-Estimates include individual controls	Trust rises with the respondent's relative income position
Steijn and Lancee (2011)	Cross-country 20 Western countries, 1999 21 European countries, 2002	INE: Conventional gini coefficient and Gini coefficient of perceived inequality O: Trust	Cross-country estimates, at one point in time Individual controls Multilevel logistic and linear models	Once we control for general wealth, the effects of actual inequality and perceived inequality are not significantly different from the zero
Uslaner and Brown (2005)	USA	INE: Gini O: Trust, civic and political participation	Cross-sectional estimates; state controls, time fixed effect	States with higher levels of economic inequality have fewer trusters. None of the measures of political participation are significantly related to trust.
Tesei (2011)	USA,1972-2008	INE: Gini index, Theil index O :Trust, group membership	Individual data combined with community measures of community heterogeneity	Both racial fragmentation and income inequality are negatively correlated with trust. Racial fragmentation has the strongest effect. The opposite is found for group membership: income inequality has the strongest effect When income inequality between racial groups is accounted for, income inequality and racial fragmentation become insignificant.
Bjornskov (2006)	Cross-country, 88 countries	INE: Gini, O: Trust	Static cross-country estimates	The strongest determinant of trust is fractionalization and in particular income inequality

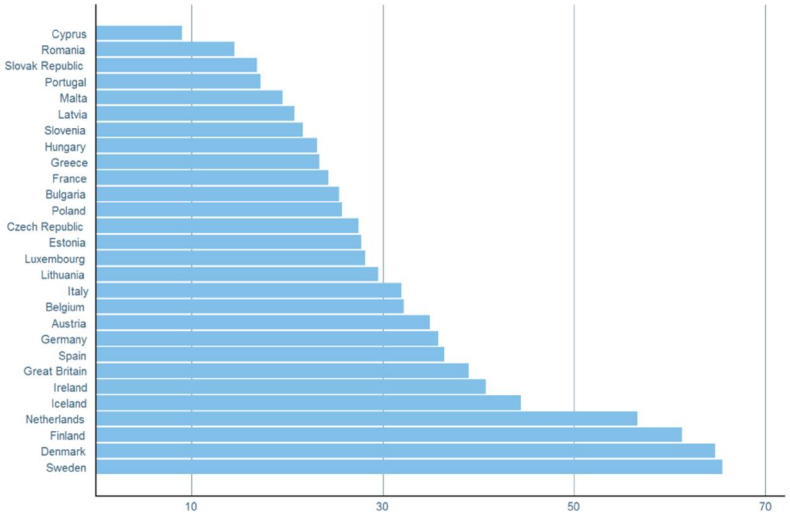
3.3. Empirical analysis

3.3.1 Social capital variables

We operationalize social capital with two indicators. The first social capital indicator captures **the level of generalized trust** reported by each respondent of the EVS. Trust constitutes a proxy for cognitive social capital and its use is motivated by several academic papers. In particular, Guiso et al. (2008 and 2010) consider that direct indicators, such as generalized trust, are adequate if social capital is considered as an individual belief about the willingness of other members of the community to cooperate.[13]

In the European Value Study, respondents are asked "*Generally speaking would you say that "most people can be trusted*" or that "*you can't be too careful in dealing with people*". The yes/no nature of the response enable us to construct a variable **trust** which is equal to one if the respondent reports that "most people can be trusted" and equal to 0 otherwise.

Chart 3.1: Share of the population reporting that "most people can be trusted"

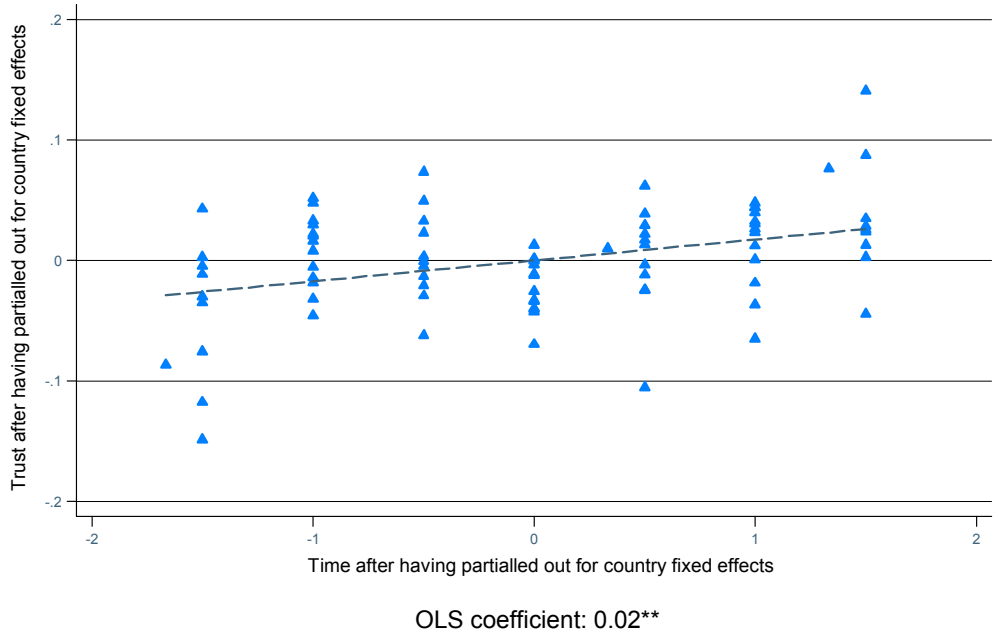


Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

[13] See Uphoff and Wijayaratna (2000) for a discussion on the distinction between structural and cognitive social capital. As discussed in Glaeser et al (2000), self-reported information on trust is subject to several limitations because the underlying question is imprecise and difficult to interpret for the respondent. Glaeser et al (2000) tackle this issue by examining the determinants of trust and trustworthiness in the context of an experiment based on Harvard undergraduates and involving monetary returns. The authors also show that individuals declaring higher levels of trust do not cooperate better in a trust game. Self-reported trust, on the other hand, seems to be associated with trustworthiness.

Chart 3.1 displays the country average value of the indicator. It is apparent that the level of trust greatly varies across countries. In Nordic countries, such as Sweden, Denmark or Finland, more than 60% of respondents are trustful while, on the opposite, in Cyprus, Romania, Slovak Republic or Portugal, less than one respondent out of 5 reports that most people can be trusted.

Chart 3.1: Evolution over time in the share of the population reporting that most people can be trusted



Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

Chart 3.2 and Table 3.2 give some information on the evolution over time in the level of trust. Chart 3.2 shows the regression line when the country-wave specific level of trust is fitted against a trend. After having partialled out for the country fixed effects, the share of people reporting that "most people can be trusted" has, on average, increased by only 1.42% between each wave.

However, as it is clear with Table 3.2, this average trend hides country differences. In Sweden, the share of people saying that most people can be trusted increased from 57.3% in 1981 to 71.6% in 2009. In Slovak Republic, on the other hand, social capital has dropped from 21.8% in the first EVS wave to 16.9% in the last one.

Table 3.2: Evolution over time in the level of trust

Country	1981-1984	1990-1993	1999-2001	2008-2010
Austria	.	32.53	34.20	38.06
Belgium	30.45	33.21	30.27	34.85
Bulgaria	.	30.40	27.04	18.84
Cyprus	.	.	.	9.023
Czech Rep	26.20	25.47	30.86	27.51
Denmark	53.79	59.17	68.10	77.84
Estonia	.	27.41	23.42	32.50
Finland	.	62.69	57.14	64.06
France	25.44	23.11	21.13	27.58
Germany	32.46	33.50	38.56	38.79
UK	43.17	43.31	28.83	40.52
Greece	.	.	23.96	22.88
Hungary	.	25.31	22.36	21.74
Iceland	39.59	43.80	41.36	52.89
Ireland	41.24	47.66	36.90	37.25
Italy	27.45	35.82	33.19	31.31
Latvia	.	18.84	17.70	25.80
Lithuania	.	31.48	25.88	31.12
Luxembourg	.	.	25.34	31.00
Malta	10.20	26.25	20.34	21.45
Netherlands	45.05	55.09	62.78	63.51
Poland	.	29.43	18.94	28.89
Portugal	.	21.71	13.03	16.96
Romania	.	15.92	9.901	17.63
Slovak	21.74	16.39	12.47	16.87
Slovenia	.	17.33	21.93	25.69
Spain	35.41	35.82	38.99	35.60
Sweden	57.30	66.13	66.92	71.65

Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

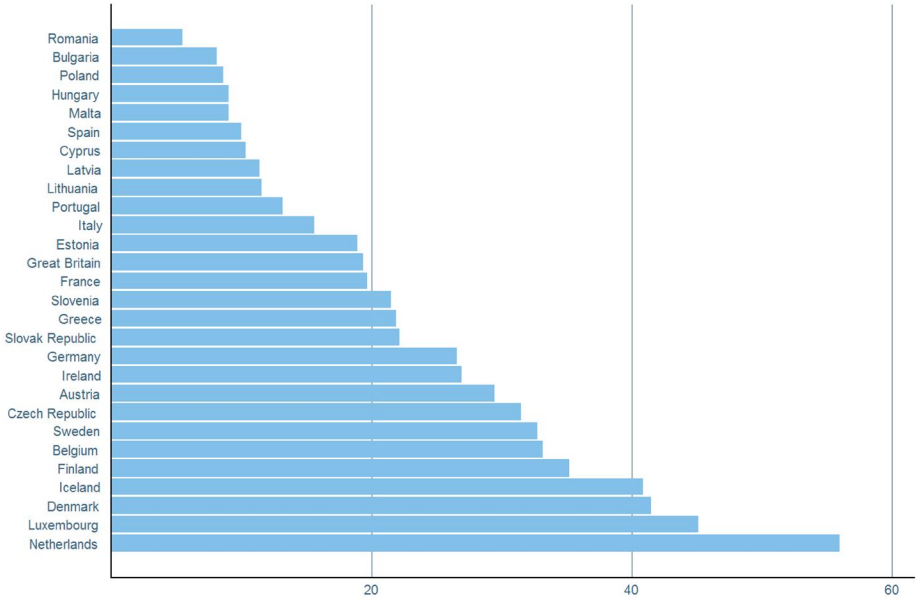
The second indicator of social capital captures the importance of **associational activity** in each EU Member State. It takes the value one if the respondent reports to belong to one of the following organizations: *human rights, conservation, the environment, ecology, animal rights, to youth work, sports or recreation, women's group, peace movement or organizations* concerned *with health* and equal to zero otherwise. Following Knack and Keefer (1997) or Rupasingha et al. (2006), we focus on "Putnamesque" networks involving "horizontal egalitarian relationship" rather than on networks based on "vertical hierarchical relationships".[14] We also check the robustness of our findings using an alternative measure of associational activity, i.e. the number of the "Putnesmesque" organizations to which each respondent belongs to.

[14] In contrast to Putnamesque groups, which are thought to play a positive role in the society, the impact of Olsonian groups such as political parties and movements, trade unions, professional associations, and various interest groups, may be negative if these groups engage in collective actions in their favor and at the expense of the rest of the society.

Though being member of an organization might be desirable *per se*, it does not convey automatically the benefits expected from social capital as the actual advantages depend on the type of relationship within the organization. The data we are using do not allow making such a distinction.

However, participation in associational activities has been largely used in the literature either in this form or in a closely related formulation and is intended to measure "structural" social capital, i.e. social networks that entails mutual beneficial actions. Participation in specific organizations reduces the "social distance" between individuals and should promote trust and cooperation (Glaeser et al, 2000). Furthermore, in societies with high income inequality, individuals belonging to the lower end of the income distribution are expected to report lower participation for income or distress-related feeling reasons (Lancee and Van de Werfhorst, 2011).

Chart 3.3: Share of the population belonging to a "Putnamesque" organization



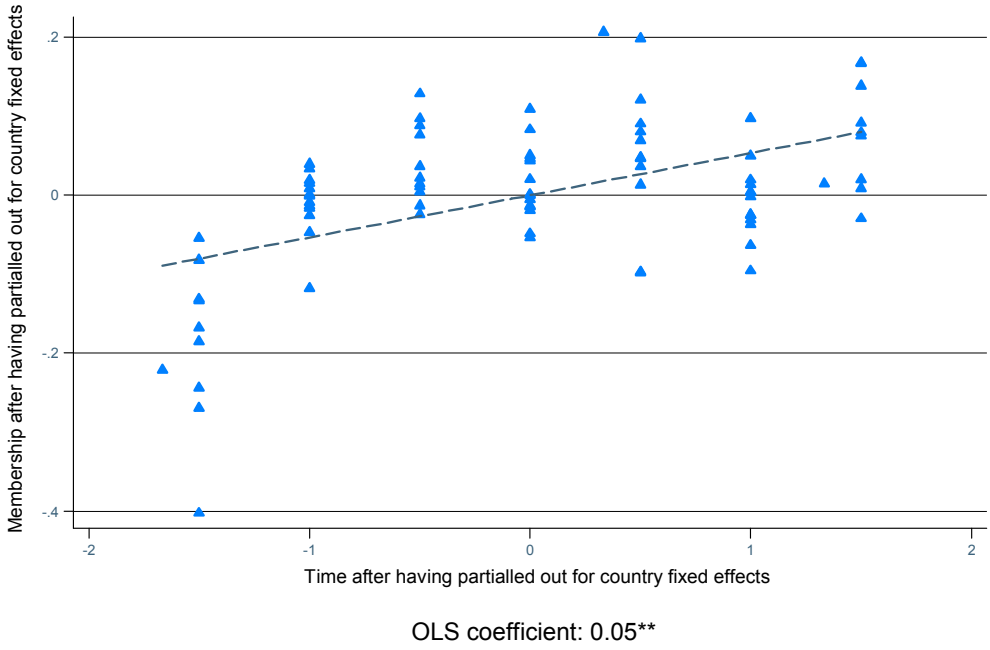
Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

Chart 3.3 displays the country average value of the indicator. Countries, such as Sweden, the Netherlands, Luxembourg, and Denmark report the highest figures whilst Eastern European countries such as Romania, Bulgaria or Poland display low levels of participation. In Denmark and Luxembourg, more than 40% of interviewed individuals are members of one of the

organizations described above. Conversely, in Poland and Romania this indicator scores below 10%.

Participation in horizontal association has substantially increased over time, by an amount equivalent to 5.3% between each wave (see Chart 4.4). Table 4.3 shows that in France and Italy, the participation in "Putnamesque" organizations has almost quadrupled and quintupled over the last 30 years. The value of the indicator has evolved much more slowly in Eastern European countries.

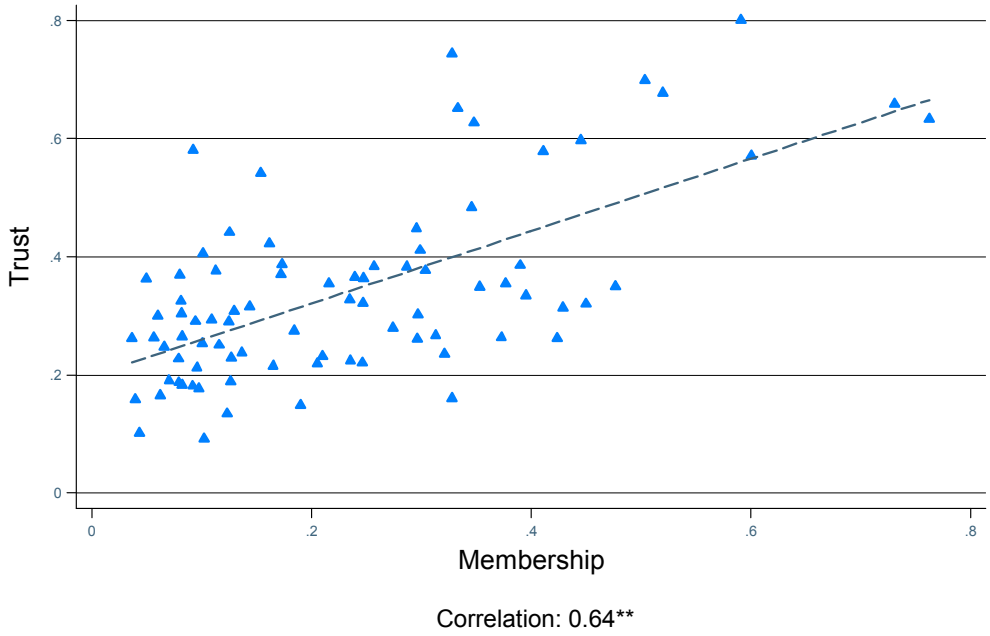
Chart 3.4: Evolution over time in the share of the population belonging to horizontal associations



Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

In general, the two indicators of social capital show that Nordic countries display high level of social capital while Eastern and Southern countries exhibit lower levels of social capital. As shown in Chart 3.5, the correlation between the two indicators is above 0.6 and significantly different from zero.

Chart 3.5: Correlation between the two social capital variables



Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

Table 3.3: Evolution over time in the share of the population participating in "Putnamesque" organizations

Country	1981-1984	1990-1993	1999-2001	2008-2010
Austria	.	25.19	37.62	25.68
Belgium	9.316	34.11	42.36	46.92
Bulgaria	.	8	8.486	7.932
Cyprus	.	.	.	10.32
Czech Rep	29.38	36.93	28.12	31.48
Denmark	15.27	44.08	49.35	57.33
Estonia	.	18.72	14.29	23.66
Finland	.	34.34	39.52	31.71
France	7.825	20.74	23.55	26.64
Germany	8.074	40.01	30.27	27.91
UK	12.67	26.42	11.74	26.83
Greece	.	.	31.41	12.41
Hungary	.	9.756	7.865	9.475
Iceland	26.26	43.76	44.95	48.46
Ireland	12.22	34.18	37.79	23.52
Italy	3.852	16.78	20.66	21.29
Latvia	.	12.79	9.330	12.26
Lithuania	.	14.43	6.660	13.65
Luxembourg	.	.	42.11	48.20
Malta	7.075	8.955	15.02	5.186
Netherlands	17.90	57.62	76.18	72.35
Poland	.	12.31	7.187	6.468
Portugal	.	15.41	15.19	8.904
Romania	.	3.905	4.642	7.831
Slovak	20.52	33.44	12.53	22.17
Slovenia	.	10.55	23.04	30.87
Spain	4.720	8.244	16.96	10.11
Sweden	9.111	39.57	51.67	30.73

Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

3.3.2. Operationalization of the empirical study

We estimate the effect of income inequality on the trust and on membership by using individual and country-level data in order to account simultaneously for both the compositional and contextual determinants of self-reported social capital. The empirical specification to be estimated is defined as follow:

$$SC_{ict} = \alpha + \beta INEQUALITY_{ct-2} + \delta X_{ict} + \gamma W_{ct-2} + C_c + \tau_t + B_{ct} + \varepsilon_{ict} \qquad (3.1)$$

where SC_{ic} is the self-reported measure of social capital for individual *i* residing in country *c*, at time *t*. As a measure of inequality, we employ the Gini coefficient, drawn from the World Income Inequality Database (see chapter 2 for additional information).[15] X_{ict} is a set of individual and household specific explanatory variables while W_{ct-2} represents 2-year lag country level variables and τ_t and C_c are respectively a linear time trend and country dummies. B_{ct} are the break dummies to account for the measurement issues in the Gini coefficient. ε_{ict} is the idiosyncratic error for individual *i* at time *t* residing in country *c*.

$INEQUALITY_{ct-2}$, corresponds to the GINI measure 2 years before the EVS survey takes place in a *given* country. Given that the EVS has 4 different waves, this implies that for each country, we cover between 1 and 4 different periods, spanning from the beginning of the 80s until 2010, according to the number of EVS waves to which the country participated (see table 2.1).

Glaeser et al. (2000 and 2002) show that social capital differences across individuals cannot be well explained by just group-level variables. Individual heterogeneity should also be taken into account. X_{ict} is meant to control for this individual heterogeneity. In particular, according to life cycle theory, investment in social capital is expected to increase and then decrease with age. This non-linear relationship is well documented in the literature (Rupasingha et al., 2006, Glaeser et al., 2000). Similarly, education is in all empirical studies found positively associated with social capital (Putman, 19995, Glaeser et al., 2002). Employment status, family status and gender are also important determinants of social capital investment. As a result, we include in equation (3.1)

[15] Note that Steijn and Lancee (2011) also examine the relationship between the perception of income inequality and trust with perception of income inequality measured using information drawn from the 1999 wave of the International Social Survey Program (ISSP). In this survey respondents were asked to estimate the actual income of different occupations. Steijn and Lancee (2011) use this information to derive a GINI-coefficient of perceived income inequality.

the following individual covariates: age (age and age squared), gender and educational level of the respondents as well as labor status and income dummies (unemployed, retired, high and low

Table 3.4 Description of Variables and Summary Statistics

	Description	Source
Outcome Variables		
Trust	Variable equal to one if the respondent replies that "most people can be trusted", 0 otherwise	EVS
Membership	Variable equal to one if the respondent report to belong to one of the following organizations: human rights, conservation, the environment, ecology, animal rights, to youth work, sports or recreation, women's group, peace movement or organizations concerned with health, 0 otherwise	EVS
Membership bis	Variable measuring the number of the following organizations to which the respondent reports to belong to: human rights, conservation, the environment, ecology, animal rights, to youth work, sports or recreation, women's group, peace movement or organizations concerned with health	EVS
Country level variables		
GINI	Gini coefficient (see chapter 2)	WIID/EUROSTAT
Log GDP per capita	Logarithm of the per capita gross domestic product in 2005 dollars	WEO
Unemployment rate	Percentage of labor force unemployed	WEO
Individual level variables		
Male	Variable equal to one if respondent is male, 0 if female	EVS
Age	Age of the respondent	EVS
Age squared	Age squared of the respondent	EVS
Unemployed	Variable equal to one if the respondent is unemployed, 0 otherwise	EVS
Self-Employed	Variable equal to one if the respondent is self-employed, 0 otherwise	EVS
Retired	Variable equal to one if the respondent is retired, 0 otherwise	EVS
Married/Cohabiting	Variable equal to one if the respondents is married or cohabits with someone at the moment of the interview	EVS
Education completion age: 15-18	Variable equal to one if the respondent completed education when he was aged between 15 and 18 years old	EVS
Education completion age: above 19 years old	Variable equal to one if the respondent completed education when he was 19 years old or more,	EVS
Childless dummy	Dummy variable equal to one if the respondent has children, 0 otherwise	EVS
Low income	Dummy variable equal to one if the respondent declares to have a low income, 0 otherwise	EVS
High income	Dummy variable equal to one if the respondent declares to have a high income, 0 otherwise	EVS
Religious	Variable equal to one if the respondent is a religious person, 0 otherwise.	EVS

Note: A time trend as well as break dummies are included in all estimates.

income).[16] In line with Glaeser et al. (2000 and 2002), we also consider a religious dummy as an additional covariate, which is equal to 1 if the respondent reports to be religious and equal to 0 otherwise. Finally, we include household related information such as the marital status and the number of children. A precise definition of each covariate entering in equation (1) is presented in Table 3.4. Correlations between individual level variables and country level variables used for the trust and membership empirical models are displayed in Tables A.6-7 and Tables A.8-9 in Appendix.

$\hat{\beta}$ is the estimated coefficient of interest which informs us on the association between income inequality and social capital. Several statistical issues might plague our results, i.e. bias $\hat{\beta}$. More specifically, $\hat{\beta}$ might be (1) capturing the effect other country specificities simultaneously correlated with income inequality and the social outcome under consideration ("omitted variable" bias) and/or (ii) the results of a reverse causality. To deal with the omitted variable issues, country dummies C_c are added in equation (1). This implies that we control for all country-time invariant effects. The possibility to add country fixed effects is the major advantage of the present analysis, compared to other macro studies on the same topic. This is possible given that we measure income inequality and all the variables in equation (1) across different periods.[17]

Several papers have shown that social capital promotes economic growth (Knack and Keefer, 1997) or judicial efficiency (La Porta, 1997), causation running the other way, i.e. from social capital to income inequality, could still be a serious concern of the present investigation. This reverse causality issue is partially taken into account by including the Gini coefficient in equation (1) with a two years lag.[18]

W_{ct-2} variables are meant to capture the effect of country time variant determinants of social capital. As these variables are potentially associated with both income inequality and social capital, failing to include them in equation (3.1) would imply that the coefficient associated with

[16] Also homeownership (DiPasquale and Glaeser, 1999) is found to contribute substantially to social capital. Owners of houses might have additional motivations to participate to the associational activities in the area of residence and might be more integrated and thus more trustful. Unfortunately information on ownership is only available for the first wave of the EVS so that we have been unable to include it as additional covariate.

[17] Note however, that if there are time variant country variables that are omitted, the coefficient associated with income inequality will be biased. W_{ct-2} partially deal with this problem.

[18] Note however that to properly tackle the reverse causality problem, we would need to find out a suitable instrumental variable for the Gini coefficient. It is not clear at this stage which variable could constitute a good instrumental variable.

income inequality would capture not only the effect of income inequality but also the influence of those additional variables on social capital. We thus include the two following macroeconomic covariates: the unemployment rate and the logarithm of GDP per capita, in 2005 US dollars at purchasing power parity. These figures are both drawn from the WEO dataset provided by the IMF.

Note that ethnic, religious or linguistic heterogeneities have often been cited as factors of social tensions (Putman, 1995, Leigh, 2006a, Rupasingha et al., 2006, Alesina and la Ferrara, 2000 and 2002) with detrimental effects on social capital accumulation, and trust in particular. Several papers discuss the relative importance of income inequality versus ethnic heterogeneity on social capital (Leigh, 2006a, Alesina and La Ferrara, 200 and 2002, Costas and Kahn, 2003), without reaching a definite conclusion. Moreover, the most commonly used proxy for ethnic diversity, the ethnic fractionalization index proposed by Alesina et al (2003), only covers one year per country and as such is inadequate for the present analysis. However, we are still able to allow for time-invariant ethnic heterogeneity thanks to the inclusion of the country fixed effects in equation (3.1).

Because recent analyses demonstrate that the presence of pervasive serial correlation in country level fixed effect models and the use of group-level variables may produce severely downward-biased standard errors (Bertrand, Duflo, and Mullainathan 2001; Donald and Lang 2001), we employ Huber-White standard errors clustered at the country level throughout the estimations. These standard errors are robust to arbitrary forms of error correlation within a country. Since to the authors' knowledge most empirical papers have neglected this issue so far, therefore this "correction" is one of the major advantages of the present analysis.

3.3.3 Econometric results

Table 3.5 presents the estimated coefficients of the model (3.1). Model of column 1 includes the Gini coefficient, a linear trend as well as country and break dummies. Because of the country fixed effects, the coefficient associated with income inequality is identified only through within country variations. In column 2, we include individual level variables while in column 3, we also

control for the 2 time-varying macroeconomic variables. Linear models are used for estimating equation (4.1) and the *t*-statistics reported in brackets are clustered at the country level.

Trust and income inequality

Results reported in the first column of Table 3.5 show that income inequality is not related to trust when no individual and macroeconomics covariates are included in equation (3.1). However, when we control for the individual characteristics, the coefficient associated with the Gini index becomes significantly different from zero and the negative sign suggests that people are more trustful in countries with low levels of income disparity. Adding country time-variant variables (column 3) makes the estimate of the relationship between income inequality and trust even more precise. This result is opposite to Stein and Lancee (2011). Indeed, the authors conclude that income inequality is no longer related to trust when wealth differences across countries are taken into account. However, Stein and Lancee (2011) do not include country fixed effects given that their data are cross-sectional. We thus think that their findings are less robust than those presented here.

The magnitude of the coefficient associated to the Gini coefficient doubles when we include time country variables, moving from -0.004 in column 2 to -0.008 in column 3. Based on the latter, it means that if the Gini coefficient in Romania drops to the Swedish level, i.e. from 36 to 25 (2008 levels), the average value of the trust indicator will increase in Romania by almost 54%[19]. Analogously, if the value of the Gini coefficient decreases by one standard deviation (4.32), then the average value of trust in the sample will rise by 10%.

Results reported in the last 4 columns of Table 3.5 suggest that the relationship between trust and income inequality is robust to alternative specifications. In columns 4 and 5, we have estimated equation (3.1) using different lag structures of the Gini coefficient. In particular, in columns 4 and 5, we assume that income inequality affects trust, with respectively no lag and one year lag. In column 6, we use a three year moving average centered on year t-2 to smooth out some of the noise associated with the construction of the Gini indices. For consistency purposes, we have used the corresponding lags for the two other country level variables, the logarithm of GDP per

[19] [(36-35)*0.008]/0.16, with 0.16 being the average value of trust in Romania in 2008.

capita and the unemployment rate. Results reported in columns 4-6 show that irrespective of the lag structure employed, the Gini coefficient remains negative and statistically different from zero. Finally, in the last column of Table 4.5, we have re-estimated equation (3.1) using a probit model to account for potential nonlinearity in the function linking the explanatory and dependent variables. We report the marginal effect at the average value of the explanatory variables. Results are identical to those displayed in columns 3. Trust is negatively and significantly associated with income inequality with the point estimate of the marginal effect of income inequality being equal to -0.008.

Trust and the other covariates

Results for the other covariates are mostly in line with the exiting literature. The comments below are based on the specification displayed in column 3. Education, employment status, and income are significantly associated with generalized trust. In particular, education seems to be a key determinant of trust. Individuals reporting to have completed education when they were 19 years old or older (a proxy for a tertiary education level) display trust levels that are on average 15% higher than respondents having completed education before reaching 15 (reference category). Similarly, individuals having completed education between 15 and 18 years are about 6% more trustful than the reference category (i.e., having not completed education). Unemployment is also a source of lower trust .Additionally, individuals with a low (high) income display trust levels inferior (superior) with respect to the respondents with a medium income. Age is positively associated with trust, though trust is not following an inverted U shape over the life cycle. Interestingly, childless individuals tend to be more trustful than those having children. Contrary to what has been observed in Alesina et al. (2002), in Europe women do not prove to be less trusting than men. Additionally, religious individuals do not display higher levels of trust than atheist or not religious respondents.

The two country level variables, GDP per capita and unemployment rate, are not significantly different from zero. While this might seem surprising at first glance, two comments are worth making. First, country fixed effects have been included in all specifications. This implies that the vector of coefficient $\hat{\gamma}$ identifies the effect of the *variation* over time, within country, of both macroeconomic variables. As a matter of fact, if the country dummies are not included in

equation (3.1), the GDP per capita is positively and significantly associated with trust while the Gini coefficient still shows a negative correlation with trust.[20] Second, we control at the individual level for the unemployment status and the income level and these two variables are strongly related to self-reported trust. In other words, the two country level variables only measure the effect on trust of living in a society with a low/high GDP per capita and unemployment rate once the personal situation of the respondent has been accounted for (Di Tella and MacCulloch, 2001). Our results suggest that what matter is more the individual situation in terms of income and job status than the aggregated effect at the national level.

[20] Results are not reported in table 3.5 but are available upon request.

Table 3.5: Impact of income inequality on trust

	Main specifications (columns 1-3)			**Robustness checks (columns 4-7)**			
	Lags of country-level variables						
	2-year	***2-year***	***2-year***	***No lag***	***1-year***	***3 years moving average***	***2-year***
							Probit
Gini coefficient	**-0.003**	**-0.004***	**-0.008****	**-0.007****	**-0.006***	**-0.008****	**-0.008*****
	(-1.68)	**(-2.06)**	**(-2.55)**	**(-2.07)**	**(-2.00)**	**(-2.70)**	**(-2.61)**
Age		0.004*	0.004*	0.004*	0.004*	0.004*	0.004**
		(2.04)	(2.03)	(2.03)	(2.05)	(2.05)	(1.97)
Age squared		-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
		(-1.07)	(-1.07)	(-1.06)	(-1.08)	(-1.09)	(-0.98)
Education completion age: 15-18 years		0.058***	0.058***	0.057***	0.057***	0.058***	0.067***
		(6.71)	(6.78)	(6.58)	(6.63)	(6.75)	(6.43)
Education completion age: above 19 years		0.148***	0.149***	0.148***	0.148***	0.149***	0.165***
		(9.52)	(9.66)	(9.47)	(9.48)	(9.56)	(10.51)
Retired		-0.026***	-0.027***	-0.026***	-0.027***	-0.027***	-0.031***
		(-2.93)	(-2.96)	(-2.97)	(-3.05)	(-2.94)	(-2.97)
Unemployed		-0.051***	-0.052***	-0.052***	-0.053***	-0.052***	-0.060***
		(-4.21)	(-4.20)	(-4.23)	(-4.30)	(-4.24)	(-4.61)
Low Income		-0.033***	-0.033***	-0.034***	-0.034***	-0.033***	-0.037***
		(-5.41)	(-5.57)	(-5.64)	(-5.59)	(-5.61)	(-5.82)
High Income		0.053***	0.053***	0.053***	0.053***	0.053***	0.057***
		(6.99)	(7.01)	(6.89)	(6.85)	(6.99)	(7.27)
Male		0.003	0.003	0.003	0.003	0.003	0.003
		(0.49)	(0.49)	(0.49)	(0.48)	(0.49)	(0.48)
Religious		0.008	0.008	0.008	0.008	0.008	0.007
		(0.60)	(0.60)	(0.61)	(0.60)	(0.60)	(0.54)
Married or cohabiting		-0.010*	-0.010*	-0.010*	-0.010*	-0.010*	-0.011**
		(-2.00)	(-1.95)	(-2.02)	(-1.98)	(-1.91)	(-2.04)
Childless		0.018***	0.018***	0.018***	0.018***	0.018***	0.020***
		(2.91)	(2.92)	(2.84)	(2.89)	(2.91)	(2.93)
Residence: big city		0.008	0.008	0.007	0.007	0.008	0.009
		(0.94)	(0.92)	(0.78)	(0.82)	(0.91)	(1.00)
GDP per capita			0.025	0.024	0.005	0.019	0.036
			(0.45)	(0.89)	(0.13)	(0.35)	(0.58)
Unemployment rate			0.006	0.005	0.004	0.006	0.007
			(1.37)	(1.56)	(0.98)	(1.20)	(1.55)
Time trends	YES	YES	YES	YES	YES	YES	YES
Break dummies	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES
R-squared	0.102	0.125	0.125	0.125	0.125	0.125	0.125
Number of observations	56,037	56,037	56,037	56,037	56,037	56,037	56,037

Note: Cluster robust t-statistics at country level are reported in brackets. ***, **, * coefficients significant at respectively 1%, 5% and 10%.

Membership and income inequality

Results reported in Table 3.6 show the association between social capital and income inequality when social capital is measured by the participation in "Putnamesque". The coefficient associated with the Gini coefficient is not significantly different from zero, irrespective of the covariates included in the analysis. This suggests that participation in associational activity is not affected by the country level of income disparities. In columns 4-8, we present further estimates of the relationship between membership and income inequality. Column 4 displays the results when the Gini coefficient and the macroeconomic variables are contemporaneous to the dependent variable while column 5 reports the estimates when both the Gini coefficient and the macroeconomic variables are lagged one year. In column 6, we use a three years moving average centered at t-2 for the Gini coefficient and the two macroeconomic variables. In column 7, we have re-estimated equation (3.1) using a probit model. The conclusion regarding the association between membership and income inequality remains unchanged. Finally, we have also checked if the results concerning the effect of income inequality on associational activity are modified when the membership indicator used so far is replaced by the cumulative *number* of "Putnamesque" organizations to which each respondent belongs to. Again we do not find any relationship between membership and income inequality.

Membership and the other covariates

The discussion below relies on the estimations presented in column 3 of Table 3.6. As for the membership indicator, we find that education is a significant determinant of participation in associational activities. The magnitude of the estimated coefficients of the two education dummies are strikingly similar to those observed for trust. Being unemployed reduces participation in associations by 7%. Given that we also control for individual income, this result suggests that the unemployment status is detrimental *per se* for the formation of social capital (i.e. not only through the income loss associated with it).

Table 3.6: Impact of income inequality on membership

	Main specifications (columns 1-3)			Robustness checks (columns 4-8)				
	Lags of country-level variables							
	2-year	*2-year*	*2-year*	*Nolag*	*1-year*	*3 years moving average*	*2-year Probit*	*2-year Membership : change in the definition*
Gini coefficient	**-0.002**	**-0.003**	**-0.001**	**-0.000**	**0.000**	**0.001**	**-0.001**	**-0.003**
	(-0.49)	**(-0.88)**	**(-0.16)**	**(-0.09)**	**(0.08)**	**(0.30)**	**(-0.22)**	**(-0.48)**
Age		-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.004***	-0.003*
		(-2.65)	(-2.74)	(-2.71)	(-2.72)	(-2.72)	(-2.93)	(-1.90)
Age squared		0.000*	0.000**	0.000*	0.000**	0.000*	0.000**	0.000
		(1.97)	(2.09)	(2.04)	(2.07)	(2.05)	(2.21)	(1.51)
Education completion age: 15-18 years		0.048***	0.047***	0.047***	0.047***	0.047***	0.068***	0.064***
		(7.00)	(7.06)	(7.19)	(7.08)	(7.13)	(8.08)	(5.64)
Education completion age: above 19 years		0.116***	0.116***	0.116***	0.115***	0.116***	0.142***	0.172***
		(11.10)	(11.14)	(11.23)	(11.25)	(11.14)	(12.21)	(8.81)
Retired		-0.011	-0.012*	-0.012*	-0.012*	-0.011*	-0.016**	-0.017*
		(-1.60)	(-1.87)	(-1.81)	(-1.84)	(-1.74)	(-2.24)	(-1.95)
Low Income		-0.036***	-0.038***	-0.037***	-0.038***	-0.037***	-0.044***	-0.045***
		(-4.42)	(-4.83)	(-4.75)	(-4.85)	(-4.76)	(-6.38)	(-3.86)
Unemployed		-0.071***	-0.072***	-0.073***	-0.072***	-0.072***	-0.077***	-0.092***
		(-6.09)	(-6.46)	(-6.75)	(-6.62)	(-6.50)	(-8.33)	(-6.17)
High Income		0.045***	0.044***	0.044***	0.044***	0.044***	0.044***	0.061***
		(6.48)	(6.35)	(6.27)	(6.33)	(6.29)	(7.32)	(5.87)
Male		0.038***	0.037***	0.037***	0.037***	0.037***	0.041***	0.020
		(5.32)	(5.31)	(5.29)	(5.31)	(5.31)	(5.52)	(1.39)
Religious		0.022**	0.022**	0.022**	0.022**	0.022**	0.021**	0.039***
		(2.36)	(2.35)	(2.35)	(2.35)	(2.40)	(2.34)	(2.80)
Married or cohabiting		-0.003	-0.003	-0.003	-0.003	-0.003	-0.004	-0.000
		(-0.56)	(-0.63)	(-0.55)	(-0.66)	(-0.61)	(-0.85)	(-0.06)
Childless		0.026**	0.026**	0.026***	0.026**	0.026**	0.027***	0.030**
		(2.77)	(2.76)	(2.79)	(2.74)	(2.73)	(2.66)	(2.33)
Residence: big city		-0.019**	-0.020***	-0.019**	-0.020***	-0.019***	-0.017**	-0.036***
		(-2.59)	(-3.01)	(-2.70)	(-3.00)	(-2.80)	(-2.48)	(-3.45)
GDP per capita			-0.218	-0.076	-0.235	-0.097	-0.219	-0.325
			(-1.27)	(-1.49)	(-1.43)	(-1.17)	(-1.18)	(-1.19)
Unemployment rate			-0.007	-0.002	-0.006	-0.004	-0.008	-0.008
			(-1.18)	(-0.35)	(-1.19)	(-1.08)	(-1.15)	(-0.88)
Time trends	YES	YES	YES	YES	YES	YES	YES	YES
Break dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.137	0.165	0.166	0.166	0.166	0.165	0.165	0.151
Observations	58,309	58,309	58,309	58,309	58,309	58,309	58,309	58,309

Note: Cluster robust t-statistics at country level are reported in brackets. . ***, **, * coefficients significant at respectively 1%, 5% and 10%.

Contrary to the findings of the trust equation, males, religious and childless individuals display higher levels of participation in "putnamesque" organizations. In addition, respondents living in big cities are around 2% more likely to participate in associational activities..

Finally, the GDP per capita and the unemployment rate are not significantly different from zero in explaining the probability of participating in associational activities.[21] These findings suggest that compositional changes in income and employment have no effect on membership, when the individual heterogeneity is taken into account.

The empirical analysis presented in this chapter suggests heterogeneous results. On the one hand, income inequality appears to be negatively and significantly associated with trust, and this relationship is robust to several specifications. On the other hand, participation in associational activities does not show any statistically significant correlation with income disparities.

[21] As we state in the preceding section, this is probably the result of controlling concurrently for the country fixed effects and the macroeconomic variables.

4. The impact of income inequality on happiness

4.1 The rationale

The discussion on whether income inequality affects an individual's happiness dates back to theoretical considerations on relative deprivation and relative utility and refers to the idea that people's utility depends not only on their own income but also on their relative position in the society (van de Stadt, Kapteyn and van de Geer, 1985). In addition, some scholars suggest that individuals can have a "taste for equality". In particular, Thurow (1971, p.327) proposes that "the individual is simply exercising an aesthetic taste for equality or inequality similar in nature to a taste for paintings".

An intuitive and comprehensive explanation of the impact of income inequality on individuals' well-being is provided by Hirschman and Rothschild (1973). These authors use the analogy of a traffic jam on a two-lane motorway to explain the effect of income inequality on happiness and call this the "tunnel effect"' (Hirschman and Rothschild (1973), p.545):

> "Suppose that I drive through a two-lane tunnel, both lanes going the same direction, and run into a serious traffic jam. No car is moving in either lane as far as I can see (which is not very far). I am in the left lane and feel dejected. After a while the cars in the right lane begin to move. Naturally, my spirits lift considerably, for I know that the jam has been broken and that my lane's turn to move will surely come any moment now. But suppose that the expectation is disappointed and only the right lane keeps moving: in that case I will at some point become quite furious".

This analogy nicely illustrates several important aspects in the relationship between income inequality and happiness. First, inequality may convey information about future prospects. This means that if I observe that the people around me are moving, then I expect to be able to move upward soon too. This suggests that income inequality might have a positive effect on individuals' wellbeing.

Second, the positive impact of inequality might turn negative if these expectations are not fulfilled, i.e. if my lane is still not moving. This has important consequences for countries in

different development stages and there is empirical evidence on transition countries supporting this notion (as discussed below).

Last, the question arises at what point people do get "upset" about their lane not moving. This refers to people's beliefs on whether mobility is possible in their country and how difficult it is for people to move upwards.

In conclusion, income inequality might affect positively the individual's level of happiness if people perceive that in their society upward mobility is possible. However, if individuals think that it is very unlikely to reach a higher income, then income inequality will probably impact negatively on happiness.

4.2 Existing empirical evidence

There exists quite substantial empirical evidence on the impact of income inequality on happiness or life satisfaction, mainly covering the U.S., Europe and transition countries (for an overview see Table 4.1). As anticipated theoretically, the effect of income inequality on happiness critically depends on whether (i) individuals perceive the society open to upward mobility and (ii) it is likely that they will eventually be able to reach higher income levels. Evidence can thus be divided into the low-mobile countries (typically European), where inequality has a negative effect on satisfaction, and the highly mobile society such as the U.S. and transition countries, where there seems to be a greater variability in the outcomes of income inequality.

For European countries, Senik (2006) finds that inequality has a negative effect on life satisfaction. Alesina et al. (2004) show that this result is driven by the detrimental effect of income inequality on people with low income and to those belonging to the left ideological spectrum. On the contrary, richer individuals seem indifferent about income inequality.

Schwarze and Harpfer (2007) report that income inequality has a negative effect on life satisfaction in Germany, while Ferrer-i-Carbonell (2005) show that the higher the income of the reference group is, the lower is the level of happiness. Clark (2006) reports similar findings for Britain while using life satisfaction as the outcome. Additionally, Clark (2006) argues that higher

income inequality within the reference group actually increases life satisfaction. The latter effect might convey some form of 'opportunity' feeling similar to some of the findings in the U.S.

The evidence for the U.S. is somewhat mixed. Senik (2006) conclude that, in contrast to the evidence from Europe, inequality in the U.S. has a positive effect on life satisfaction. This result is challenged by evidence provided by McBride (2001), Luttmer (2005), and Dynan and Ravina (2007). These scholars report that a higher 'reference group income' negatively affects happiness. A more nuanced view can be found in Alesina et al. (2004), who investigate different income levels and incorporate the political preferences of individuals. Their finding is that in the U.S. it is the rich people, who are particularly unhappy about higher levels of income inequality, whereas the poor are indifferent to inequality. Hence, some of the contrasting evidence might be explained by different samples of individuals.

Last, several studies exist on the impact of inequality on happiness in transition countries. While Sanfey and Teksoz (2005) show that inequality has a negative impact on life satisfaction in various transition countries, Senik (2006) conclude that the income of the reference group and the level of satisfaction are positively related in transition countries. Moreover, the author provides evidence that this effect is particularly strong for younger people, i.e. below 41 years, and for individuals, who experienced higher income volatility. Similarly, for Russia, Senik (2004) finds a positive impact of the 'reference group income' on life satisfaction and no significant effect for income inequality. The variability of the results is confirmed in Grosfeld and Senik's (2008) study on Poland. Here, the authors find that there has been a major structural change in the perception of income inequality after 1997. Before 1997, income inequality is positively associated with life satisfaction and individual's expectations about the future. After 1997, however, income inequality is not significantly associated anymore with life satisfaction. This is explained by the perception of Polish people that they were not benefitting from the economic transformation.

In conclusion, empirical evidence strongly suggests that the perception of income inequality as a negative force in the society depends critically on the perceived country mobility and might differ by income group, political preferences, and age. For Europe, a negative impact of income inequality or of the 'reference group income' on happiness is observed. Transition between

political regimes may render the association inequality/happiness positive or negative in time depending on the level of expectation raised and their possible fulfillment or delusion.

Table 4.1: Studies on income inequality and happiness

Author	Data	Inequality measure (INE) Main outcome (O)	Method	Results
Alesina, Di Tella, & MacCulloch, 2004	US, individuals Period: 1981-1996 12 European countries, individuals, 1975-1992	INE: Gini O: Happiness or life satisfaction	Ordered probit, state and year dummies, robust standard errors	Overall inequality found to decrease happiness. However, strong differences between US and Europe: in the US, the rich are unhappy about inequality and poor are indifferent while in Europe the poor and leftist individuals care about inequality and rich are indifferent.
Dynan & Ravina, 2007	US, individuals, 1979-2004	INE: relative income measure: own group income – other people's income O: Happiness	Pooled OLS	Happiness is higher if income of own group is higher than the income of other people
Schwarze & Harpfer, 2007	West Germany, individuals 1985-1998	INE: Gini, Theil and Atkinson, - income quintile O: Life satisfaction	Ordered probit, region and time fixed effects and individual random effects, robust standard errors (and also pooled OLS and panel fixed effects)	Inequality: negative effect on life satisfaction, but only when measured with Gini or Theil, not for Atkinson Relative income position (income quintile): no impact on life satisfaction
Clark A. E., 2006	Britain, individuals, 1991-2002	INE: Gini based on reference group income O: Life satisfaction and the GHQ-12	Ordered probit, clustered standard errors (but also panel random effects, fixed effects logit and random effects probit)	Reference group income has a negative impact on life satisfaction. Life satisfaction is positively related to reference group income inequality.
Grosfeld & Senik, 2008	Poland, individuals,	INE: Gini, reference group income	Ordered logit, year and region dummies, clustered standard errors (and sup-Wald	Both satisfaction and expectations of the future are positively influenced by inequality up to 1997. Afterwards, inequality has no effect on expectations and has a negative effect on

	1992-2005	O: Life satisfaction and private expectations of the future	test)	satisfaction. Similar results when the income of the reference group is used.
Sanfey & Teksoz, 2005	19 European countries 1981-84,1990-93, 1995-97, 1999-2002	INE: Gini O: Life satisfaction	Ordered probit, country dummies	High inequality is associated with lower life satisfaction for transition countries and with higher life satisfaction for non-transition countries.
Senik, 2006	European countries, transition countries, US, individuals	INE: reference income and surplus of individual income beyond reference income O: Life satisfaction	Conditional fixed effects logit, time dummies (also ordered probit model)	Inequality is negative for 'old' European countries and positive in post-transition economies and the US
Luttmer, 2005	US, individuals, 1987-88, 1992-94	INE: Reference income in the neighborhood O: Happiness	Pooled OLS, state, survey wave, and individual fixed effects (also ordered probit)	Higher reference earnings are associated with lower levels of happiness
Senik, 2004	Russia, individuals, 1994-2000	INE: Reference group income, Gini O: Life satisfaction	Ordered probit with Mundlak transformation of exogenous variables or individual fixed effects, and year and region fixed effects	Reference group's income has a positive effect on satisfaction. Inequality indices do not affect individual satisfaction.
McBride, 2001	US, individuals 1994, and 1972, 1977, 1982, 1986, 1992 and 1996	INE: reference group income O: Happiness	Ordered probit	Reference group income has a negative effect on happiness.
Ferrer-i-Carbonell, 2005	Germany, individuals, 1992-1997	INE: reference group income, distance between the individual's own and the reference group income O: Life satisfaction	Ordered probit, fixed time effects and individual random effects incorporating Mundlak transformation	Reference group income has a negative impact on happiness. Individuals are happier the larger their income is in comparison to the reference group.

4.3 Empirical analysis

4.3.1 Happiness variable

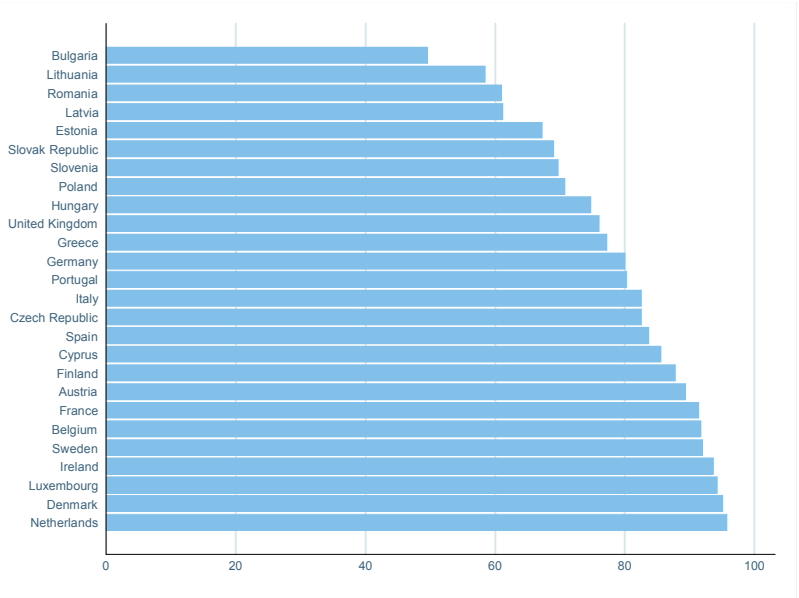
The happiness variable is taken from the European Value Survey (EVS) and is related to the following question: "*Taking all things together, would you say you are: very happy, quite happy, not very happy, or not at all happy*". The indicator ranges from 4, i.e. very happy, to 1, i.e. not at all happy. This measure of happiness is the most commonly used in the existing literature.

In the empirical analysis, we have collapsed the four categories into two categories so as to create a dummy variable which takes the value one if the individuals report that they feel "very/quite happy", and zero otherwise. The reasons to proceed in such a way are the following.. First, respondents seem not to be evenly distributed across the 4 scores and hence this might affect the representativeness of the sample in the different countries. Second, as it will be explained below, statistically speaking, there is no difference between the categories 1 and 2, i.e. "not at all happy" and "not too happy", as well as between the categories 3 and 4, i.e., "quite happy' and "very happy".

Chart 4.1 shows the country share of individuals that report a high value of the happiness indicator (i.e., reporting to be "quite/very happy"). There are stark differences across European Member States and these variations suggest a regional clustering. In fact, excluding Czech Republic, all Eastern European countries report the lowest level of happiness, while Nordic countries (Sweden, Denmark, the Netherlands) along with Ireland display the highest level of happiness.

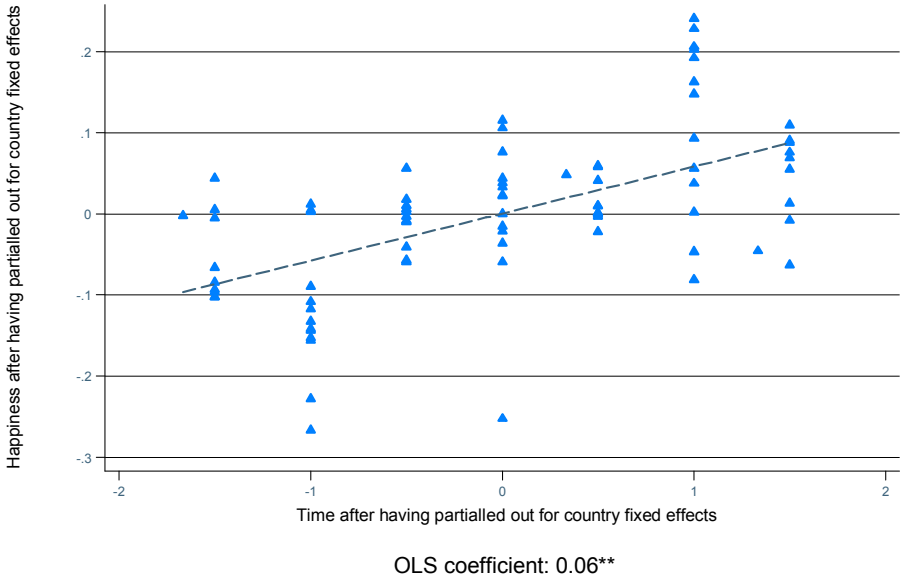
Chart 4.2 and Table 4.2 provide further information on the evolution over time of the share of people reporting high scores of happiness. Chart 4.2 shows the regression line when the country-wave specific level of happiness is fitted against a trend. After having partialled out for the country fixed effects, the proportion of people reporting to be ''quite/very happy" has, on average, increased by 0.06 % between each wave.

Chart 4.1: Share of the population reporting to be quite/very happy



Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

Chart 4.2: Evolution of the share of individuals reporting to be quite/very happy



Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

However, looking at the Table 4.2, the general increasing trend masks significant country differences. The Eastern European countries display the highest increase in the

proportion of people reporting to be "quite/very happy", while this marked increase in happiness can only be observed in few Western European Member States. Finally, the share of happy individuals steadily decreased in Sweden, Austria, Finland, Germany and the Netherlands.

Table 4.2: Evolution of the share of individuals reporting to be quite/very happy

Country	1981-1984	1990-1993	1999-2001	2008-2010
Austria	.	92.40	89.99	90.60
Belgium	93.32	93.04	92.35	95.20
Bulgaria	.	39.68	49.36	60.91
Cyprus	.	.	.	85.63
Czech Republic	.	79.55	87.49	85.83
Denmark	95.96	94.89	95.60	97.22
Estonia	.	60.50	66.54	80.25
Finland	.	89.49	91.47	85.97
France	91.63	91.32	92.04	92.63
Germany	87.33	87.42	79.80	79.03
Greece	.	.	75.79	80.90
Hungary	.	69.39	74.09	80.39
Ireland	96.35	93.69	96.56	94.18
Italy	78.79	85.90	82.07	88.87
Latvia	.	54.64	58.64	77.51
Lithuania	.	53.11	77.39	67.30
Luxembourg	.	.	94.07	94.59
Netherlands	97.27	95.01	95.65	96.76
Poland	.	56.59	76.34	88.01
Portugal	.	74.66	87.86	85
Romania	.	61.76	46.10	75.56
Slovak Republic	.	60.69	71.47	81.46
Slovenia	.	56.46	76.95	86.88
Spain	80.51	86.53	88.41	90.56
Sweden	96.09	.	94.04	89.39
United Kingdom	.	95.19	90.68	91.12

Source: European Values Studies, Waves 1981-1984, 1990-1993, 1999-2001, 2008-2010

4.3.2 Operationalization of empirical study

As discussed in Chapter 2, we carry out the empirical investigation by estimating models of the form:

$$Happiness_{ict} = \alpha + \beta INEQUALITY_{ct-2} + \delta X_{ict} + \gamma W_{ct-2} + C_c + \tau_t + B_{ct} + \varepsilon_{ict} \quad (4.1)$$

where $Happiness_{ic}$ is the happiness measure for the individual i residing in the country c, at the time t. The INEQUALITY variable is the two-year lag of the Gini coefficient of the country c. X_{ict} is a vector of individual specific explanatory variables, while W_{ct-2} represents a set of macroeconomic variables which are correlated with both the inequality measure and the happiness variable. All models include a vector of country dummies, C_c,

that controls for mean country differences in the level of happiness, a linear trend, τ_t, that account for linear shift in the happiness variable common to all countries, and a set of break dummies, B_{ct}, that aims at removing the variation in the Gini index, which is caused by the different methodologies used to construct the Gini index (see chapter 2 for more detailed information).

The variables considered in the vector X_{ict} consist of a series of personal characteristics of the respondents that have previously been found to affect individual happiness (amongst others, see Blanchflowers and Oswald, 2000 Di Tella et al., 1997, and Alesina et al., 2004). More precisely, the variables employed are age and its square, a dummy for men, education dummies, labor status of the respondent (unemployed, retired), and dummies for high and low income. We also include some socio-demographic characteristics such as an indicator of the absence of children in the family, a dummy for marital status, a dummy for living in an urban area and a variable indicating if the respondent is a religious person. A precise definition of each covariate entering in equation (4.1) is presented in Table 4.3.

The vector $\mathrm{W}_{\mathrm{ct}-2}$ of macroeconomic variables aims at controlling for the effect of country time-variant determinants of happiness. As these variables are also correlated with income inequality, failing to include them would imply that the coefficient associated with income inequality would capture not only the effect of income inequality but also the influence of those additional variables on happiness. Following Alesina et al. (2004) and Di Tella et al. (2001) we include the unemployment rate, the inflation rate and the log of per capita GDP, in 2005 US dollars. These indicators are drawn from WEO database (as described in greater detail in chapter 2). In addition, correlations between individual level variables and country level variables are displayed in Tables A.10-11 in Appendix.

Because recent analyses demonstrate that the presence of pervasive serial correlation in country level fixed effect models and the use of group-level variables may produce severely downward-biased standard errors (Bertrand, Duflo, and Mullainathan 2001; Donald and Lang 2001), we employ Huber-White standard errors clustered at the country level throughout the estimations. These standard errors are robust to arbitrary forms of

error correlation within a country. Since to the authors' knowledge most empirical papers have neglected this issue so far, therefore this "correction" is one of the major advantages of the present analysis.

Table 4.3 Description of Variables

	Description	Source
Outcome Variables		
Happiness	Variable equal to 1 if the respondent replies that is "quite/very happy"	EVS
Country level variables		
GINI	Gini coefficient (see chapter 2 for additional information)	WIID/EUROSTAT
Log GDP per capita	Logarithm of the per capita gross domestic product in 2005 dollars	IMF
Unemployment rate	*Percentage of Labor force unemployed*	IMF
Inflation rate	Annual percent change of average consumer prices	IMF
Individual level variables		
Male	Variable equal to one if respondent is male, 0 if female	
Age	Age of the respondent	EVS
Age squared	Age squared of the respondent	EVS
Unemployed	Variable equal to one if the respondent is unemployed, 0 otherwise	EVS
Self-Employed	Variable equal to one if the respondent is self-employed, 0 otherwise	EVS
Retired	Variable equal to one if the respondent is retired, 0 otherwise	EVS
Married/Cohabiting	Variable equal to one if the respondents is married or cohabits with someone at the moment of the interview	EVS
Education 15-18	Variable equal to one if the respondent completed education when he was 15-18 years old,	EVS
Education >=19	Variable equal to one if the respondent completed education when he was 19 years old or more,	EVS
Childless dummy	Dummy variable equal to one if the respondent has children, 0 otherwise	EVS
Low income	Dummy variable equal to one if the respondent declares to have a low income, 0 otherwise	EVS
High income	Dummy variable equal to one if the respondent declares to have a high income, 0 otherwise	EVS
Religious	Variable equal to one if respondent declares to be a religious person, 0 otherwise	EVS
Big city	Variable equal to one if respondent indicates that he/she lives in a city with more than 100000 inhabitants, 0 otherwise	EVS

Note: Time dummies are also included in all estimates

Since the EVS records the happiness variable as a discrete response indicator with values ranging from 4, i.e. very happy, to 1, i.e. not at all happy, the natural candidate estimator

for the equation (1) would be a maximum likelihood estimator for ordered dependent variable, namely ordered probit/logit. In fact, we started the empirical analysis estimating equation (1) by using an ordered probit model. Other than giving the estimated coefficients of the control variables, the ordered probit model estimates the cut points (and the corresponding standard errors) between the response outcomes, i.e. the thresholds that the latent continuous variable must cross to change the value of the corresponding happiness discrete variable. These estimated parameters are crucial for testing the relevance of the 4-scores happiness variable.

The results show that only the 2nd and the 3rd cut point are statistically different from zero[22], suggesting that we can rule out the lowest category referring to individuals reporting themselves as "not at all happy"[23]. In addition, by looking at the confidence bounds of the thresholds we can also discard the discontinuity between the "quite happy" and "very happy" category (the upper bound of cut2, equal to 5.82, lies far above the lower bound of cut3, which is equal to 2.3). This leaves us with the 2nd cut point to be the only statistically relevant threshold. For these reasons, we refrain from using the 4-scores variable and instead we apply the binary version of the happiness variable. As a result, the dependent variable of equation (4.1) takes on the value one if people report to be "quite/very happy" and zero otherwise. We estimate equation (4.1) using ordinary least squares and provide the probit estimates as a robustness exercise.[24] Furthermore, we also report results when a measure of life satisfaction is the dependent variable. Although happiness and life satisfaction might capture different aspects of individual wellbeing, they are highly correlated, showing a correlation coefficient above 0.75. As a result, we do not expect to detect any relevant differences between the two models.[25]

[22] cut 2: 3.09 s.e.:(1.39); cut 3: 5.02 s.e.:(1.38)

[23] cut 1: 1.9 s.e.:(1.38)

[24] Note that the OLS coefficients are readily interpretable as marginal effects at the mean of the other covariates.

[25] The EVS measures individual life satisfaction as a discrete response variable with values ranging from 10, i.e. very satisfied, to 1, i.e. not at all satisfied. However, for comparison's sake, we have estimated the model using the binary version of the life satisfaction score.

4.3.3 Econometric results

Table 4.4 presents the estimated coefficients of the equation (4.1). Columns 1-3 show the results of the models where the income inequality is measured by the 2-year lag of the Gini coefficient. Model 1 is the baseline estimate that controls only for country and break dummies, a linear time trend and the Gini coefficient. Model 2 includes a series of individual characteristics which have previously been found to affect individual happiness, while model 3 considers macroeconomic confounding variables which may potentially be correlated with both the Gini coefficient and individual happiness. Note that since the Gini coefficient is fixed within country-year clusters, only country-specific variables are likely to be a source of omitted variable bias. This is the main reason of including the macroeconomic controls in model 3.

In order to mitigate the potential issues of reverse causation, the Gini coefficient enter the equation with 2-year lag. Although this presents a deviation from the existing literature, which usually relies on contemporaneous measure of the Gini index, we think that the level of happiness might be influenced by income inequality in the past years. However, for the sake of comparison with the previous literature we also estimate the equation (4.1) including the contemporaneous Gini. This model is shown in column 4 of Table 4.4. In addition, in column 5 we present estimation results using the unweighted three-year moving average of the Gini index. Lastly, column 7 reports the model when life satisfaction is the dependent variable.

The estimates reported in column 1 of Table 4.4 show the estimated impact of the inequality on the individual happiness. The coefficient of the Gini equals to 0.009. This indicates that a 1% rise in the Gini coefficient increases the proportion of people reporting to be “quite/very happy” by 0.009 percentage points. Although very small, this result is neither consistent with our prior expectations nor with empirical results from previous research. However, this impact is estimated imprecisely. The second column adds a series of individual characteristics to the estimation model. The added control variables are economically and statistically significant with “standard” interpretations and in line with the previous literature. For instance, we find an inverted U-shaped effect

of age on happiness, i.e. younger people seem to be the least happy compared to the older ones. Having completed education at the age of 19 is associated with higher levels of happiness, as shown by the coefficient on education. Being unemployed and retired are associated with lower levels of happiness. A possible interpretation might be that these labour status are correlated with the stress of being jobless. The income dummies clearly show that money matters: earning a higher income brings happiness. Men seem not to be happier than women and following a religion makes people happier. Regarding the marital status, we find that married or cohabiting people are happier than unmarried or single ones. In addition, people seem to be less happy if they have at least one child. This lower level of happiness for individuals with children might be caused by the preoccupations and responsibilities associated with raising children.

Column 2 of Table 4.4 shows a positive effect of the Gini index on individual happiness. However, this counterintuitive effect might be determined by endogeneity of the Gini variable, especially the one coming from omitted country determinants of both inequality and individual happiness. To tackle this issue, in column 3 we add the following macroeconomic variables in the model: unemployment rate, inflation rate and per capita GDP. The Gini coefficient turns negatively correlated with the individual level of happiness with a magnitude of -0.004, validating our suspect that the previous models are strongly affected by omitted variable bias. Indeed, the coefficient of per capita GDP is strongly statistically significant, suggesting that the positive effect of the Gini index in column 3 stems mainly from the omission of this macroeconomic variable. However the negative effect of the Gini is far from being statistically significant.

Column 5 shows the estimated coefficients where both the Gini measure and the macroeconomic variables are calculated as unweighted three-year moving average, centered at year t-1. The estimated coefficient of the income inequality becomes smaller, moving from -0.004 in column 3 to -0.001, and negatively associated with individual wellbeing, but still not statistical different from zero.

Table 4.4: Impact of income inequality on happiness

	Main specifications (columns 1-3)			Robustness checks (columns 4-7)			
	Lags of country-level variables						
	2-year	*2-year*	*2-year*	*No lag*	*3 years moving average*	*2-year*	*2-year*
						Probit	*Probit: DV life satisfaction*
Gini coefficient	**0.009****	**0.008****	**-0.004**	**-0.004**	**-0.001**	**-0.004**	**-0.001**
	(2.74)	**(2.69)**	**(-1.18)**	**(-1.34)**	**(-0.23)**	**(-1.52)**	**(-0.47))**
GDP per capita			0.248***	0.091**	0.211***	0.210***	0.114*
			(3.38)	(2.11)	(4.38)	(3.52)	(1.92)
Unemployment rate			0.002	0.002	0.006	0.000	0.003
			(0.60)	(0.48)	(1.29)	(0.11)	(1.19)
Inflation rate			0.000	-0.000	-0.000	0.000**	0.000***
			(1.68)	0.091**	(-0.43)	0.210***	(2.24)
Age		-0.013***	-0.012***	-0.012***	-0.029***	-0.011***	-0.012***
		(-9.88)	(-8.80)	(-9.13)	(-17.52)	(-11.16)	(-10.44)
Age squared		0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
		(8.26)	(7.24)	(7.31)	(13.54)	(8.35)	(9.31)
Education: 15-18 years		0.008	0.007	0.005	0.014	0.006	0.005
		(0.95)	(0.85)	(0.61)	(1.28)	(1.01)	(0.85)
Education: above 19 years		0.039***	0.036***	0.036***	0.048***	0.038***	0.044***
		(3.79)	(3.63)	(4.13)	(3.45)	(4.77)	(5.77)
Unemployed		-0.138***	-0.144***	-0.143***	-0.218***	-0.110***	-0.143
		(-5.18)	(-5.23)	(-5.27)	(-6.38)	(-6.68)	(-8.03)
Retired		-0.035***	-0.032***	-0.034***	-0.021	-0.020***	-0.011
		(-3.88)	(-3.35)	(-3.55)	(-1.46)	(-2.59)	(1.19)
Low Income		-0.072***	-0.068***	-0.070***	-0.113***	-0.056***	-0.068***
		(-12.56)	(-11.50)	(-13.49)	(-12.88)	(-12.41)	(-13.12)
High Income		0.029***	0.027***	0.027***	0.072***	0.032***	0.058***
		(4.53)	(4.09)	(4.48)	(8.00)	(6.67)	(11.36)
Male		0.001	0.003	0.005	-0.003	0.000	0.003
		(0.15)	(0.73)	(1.30)	(-0.34)	(0.07)	(0.90)
Religious		0.023***	0.023***	0.025***	0.080***	0.023***	0.027**
		(3.19)	(3.07)	(3.50)	(7.25)	(3.41)	(2.68)
Married or cohabiting		0.106***	0.104***	0.105***	0.238***	0.096***	0.067***
		(12.67)	(11.48)	(11.54)	(17.42)	(14.69)	(12.22)
Childless		0.014**	0.016***	0.016***	0.009	0.012**	0.002*
		(2.35)	(2.83)	(2.86)	(1.01)	(2.38)	(1.92)
Residence: big city		-0.003	-0.002	-0.002	-0.018	-0.006	-0.009
		(-0.54)	(-0.43)	(-0.44)	(-1.71)	(-1.47)	(-1.42)
Time trends	YES	YES	YES	YES	YES	YES	YES
Break dummies	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES
R-squared	0.119	0.168	0.169	0.166	0.153	0.175	0.129
Observations	78769	66049	58309	62068	60706	58,309	58049

Note: Cluster robust t-statistics (z-score for the probit model) at country level are reported in brackets. ***, **, * coefficients significant at 1%, 5% and 10% respectively.

In column 6 we analyse whether our results might be affected by the functional form of the estimated model. In particular, we investigate whether the probit model, which assumes a nonlinear functional form between the explanatory variables and the dependent variable, is better suited to estimate equation (1). The marginal effects of the probit model reported in column 6 of Table 4.3 are unambiguously similar to the coefficient of the model 3, suggesting that the functional form is not a serious concern. Likewise, the coefficient of the Gini index remains statistically insignificant with a magnitude of -0.004.

Finally, we obtain similar results when individual wellbeing is proxied by life satisfaction dummy variable (column 7). The coefficient attached to the Gini index is negatively related to wellbeing but still not statistically significant.

5. The impact of income inequality on health

5.1 The rationale

The following paragraph draws mainly on d'Hombres *et al.* (2012, section 3; as well as Leigh et al., 2009, Deaton, 2003, and Gravelle, 1998) and discusses the three most widely researched mechanisms to connect income inequality and health.

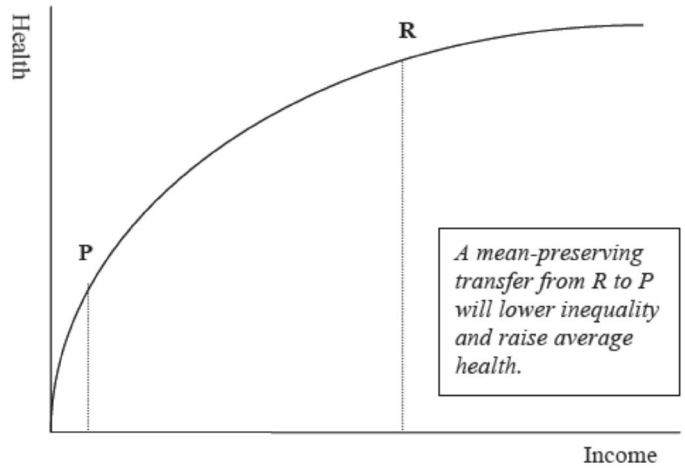
The absolute income hypothesis postulates that an individual's health status increases with individual income but at a decreasing rate (see Figure 5.1). This means that one extra Euro given to a deprived person increases his/her health status more than the same Euro spent on a rich person. Hence, there exists a non-linear relationship between income and health status. Figure 5.2 illustrates this argument by displaying at the country level the bivariate relationship between life expectancy and GDP per capita. This non-linear relationship was found between countries when comparing richer and poorer countries but also within countries (Leigh et al., 2009). As Deaton (2003) argues, this supports the idea that within a country a redistribution of income from richer to poorer individuals will increase the overall health status. In other words, under the absolute income hypothesis an effect of income inequality on health would be caused by the non-linear relationship of income and health.

The second mechanism proposed in the literature is the *relative income hypothesis*. The relative income hypothesis postulates that an individual's relative income position within a country affects the individual's health status. The rationale for this hypothesis is not clearly spelled out in the literature. Most scholars, however, propose the following mechanism: lower relative income increases chronic stress of individuals, due to an increased feeling of deprivation. This chronic stress is then seen to translate into an unhealthier life (Leigh et al., 2009).

The last mechanism to explain why income inequality might affect health relies on the idea of *societal effects* and, in particular, the effect of increased violence due to higher income inequality. Higher violence and crime rates might lead to higher death rates (i.e. homicides) but also to increased levels of stress, which then translate into worse health

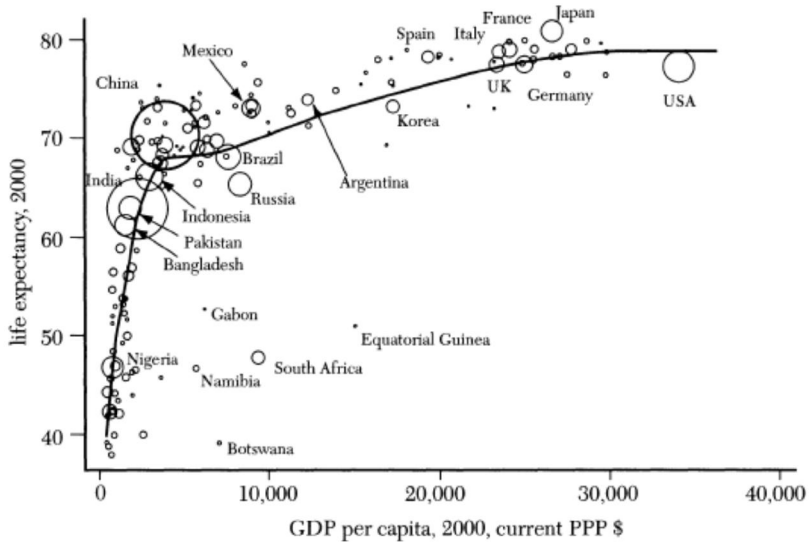
outcomes. Other societal effects mentioned in the literature are related to societal heterogeneity.

Figure 5.1: Non-linear relationship of income and health



Source: Leigh et al., 2009, p. 6

Figure 5.2: Cross- country evidence of life expectancy and income



Source: Deaton, 2003, p. 116

In particular, greater heterogeneity is seen to hinder societies to agree on investments in public goods (cf. Alesina et al., 1999). This implies, that higher income inequality might lead to lower investments in the health sector, e.g. in hospitals, and this then might translate into lower health status of the surrounding population (cf. Leigh et al., 2009).

5.2 Existing empirical evidence

As already discussed in d'Hombres et al. (2012, section 3), there exists a rich literature dating back to the 1970s analyzing the relationship between income inequality and health (an overview over the studies is displayed in Table 5.1). In a more recent series of articles Wilkinson (1992, 1994, and 1996) concludes in favor of a negative impact of income inequality on health. However, this view was challenged by scholars who pointed out strong inconsistencies in the use of data (Judge, 1995)[26] In particular, the effect of income inequality on health seems to be sensitive to the (i) selected dependent and independent variables included in the estimations, (ii) underlying regional focus of the study, (iii) estimation methods employed and (iv) unit of observation (individuals, state, or country analysis).

The comprehensive review of studies performed by Lynch et al. (2004) suggests that income inequality has not a negative effect on health status at least among wealthier nations, such as Belgium, Denmark, and Spain (ibid, p.54). In particular, Lynch et al. (2004) argue that there is a positive effect of income inequality on mortality rates in Belgium (Lorant et al., 2001) while inequality is not related to mortality or heart disease in Denmark (Osler et al., 2003), and to disabilities or life expectancy in Spain (Regidor et al., 1997). Similarly, Gerdtham and Johannesson (2004) did not find any significant effect of income inequality on mortality in Sweden. The evidence for the UK is more mixed. On the one hand, Stanistreet et al. (1999) report a significant effect of income inequality on health but, on the other hand this result is challenged by Weich et al. (2001 and 2002).

[26] In particular, Judge (1995, p.1283) points out that the econometric results produced by Wilkinson might be explained by the use of an incorrect poverty estimate and the use of different years when matching income and life expectancy.

Additional evidence is provided by Hildebrand and Van Kerm's (2009) for 11 European countries. In particular, the authors test the relationship by employing data at the NUTS0 and NUTS1 level in Austria, Belgium, Denmark, Finland, France, Greece, Italy, Ireland, Portugal, Spain and the UK. Although the authors find a statistically significant effect of income inequality on self-reported health status in EU countries, the magnitude of this effect is negligible. In contrast to the studies based on EU countries, the empirical results for the U.S. point to a consistent and negative effect of income inequality on health status (see Lynch et al., 2004).

Table 5.1: Studies on income inequality and health

Topic	Data	Inequality measure (INE) Main outcome (O)	Method	Results
Lorant et al. (2001)	Belgium, municipalities, 1985-93	INE: Gini O: Mortality and morbidity variables	Weighted least squares model and simultaneous autoregressive model	Higher income inequality is associated with lower mortality rates
Osler et al. (2003)	Denmark, individuals, 1964, 1992	INE: Median share of income in municipality O: Ischaemic heart disease	Cox's proportional hazard regression models	No clear association between income inequality and Ischaemic heart disease
Regidor et al. (1997)	Spain, regions,1986	INE: Difference in the mean household income between those at the bottom and those at the top of the income hierarchy O: Prevalence of long term disabilities	Logistic regressions	Income inequality does not affect disabilities
Gerdtham and Johannesson (2004)	Sweden, individuals, 1980-86	INE: Gini, Robin Hood index, median income, variance of income O: Survival time in years (mortality)	Cox's proportional hazard regression models	Income inequality does not affect mortality rates
Stanistreeet et al (1999)	UK, individuals, 1991	INE: squared coefficient of variation O: Mortality	OLS	Income inequality does affect mortality
Weich et al. (2001)	UK, individuals, 1991	INE: Gini O: Prevalence of mental disorder	Logistic regression, with clustered standard errors	Mental disorders were more common in areas with greater income inequality
Weich et al. (2002)	UK, individuals, 1991	INE: Gini O: Self-rated health	Logistic regressions, with clustered standard errors	Income inequality is weakly related to worse self-rated health
Hildebrand and	Austria, Belgium, Denmark, Finland, France, Greece, Italy,	INE: Gini, Theil index, mean log deviation, coefficient of variation, ratio of 90/10	Panel fixed effects estimation	Income inequality is negatively related to self-rated health status but the magnitude

Van Kerm (2009)	Ireland, Portugal, Spain and the UK, NUTS0 and NUTS1 level, 1994-2001	O: Self-reported health status		of the impact of inequality on health is low
Leigh and Jencks (2007)	Australia, Canada, France, Germany, Ireland; Netherlands, New Zealand, Spain, Sweden, Switzerland, UK, US, 1903 - 2003	INE: Income of richest 10% O: Life expectancy at birth and infant mortality	Country and year fixed effects estimation, robust s.e., clustered at country level	No relationship between mortality and inequality

5.3 Empirical analysis

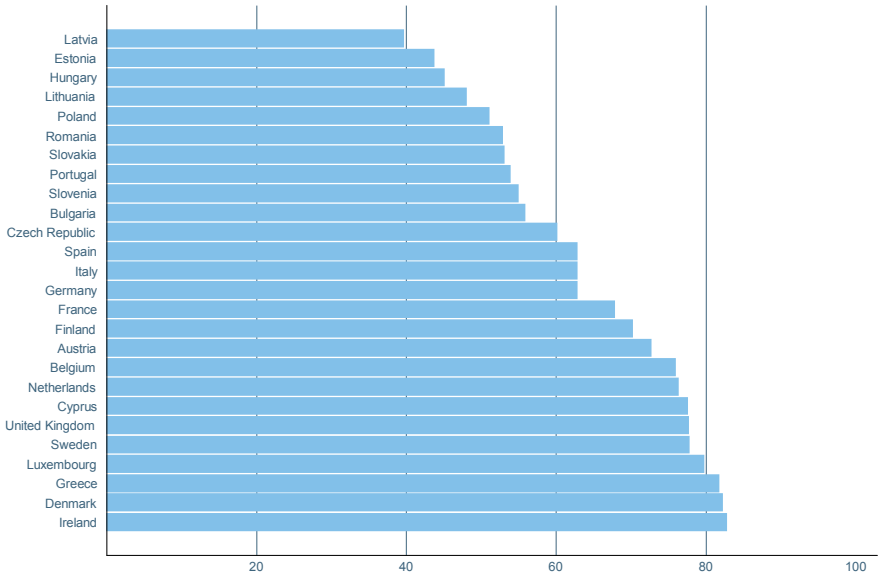
5.3.1 Health variables

While there are some cross-country studies (cf. Leigh and Jencks, 2006; and Judge et al., 1998) on the effect of income inequality on health, more elaborated studies use individual-level data (see Hildebrand and Van Kerm, 2009; Gerdtham and Johannesson, 2004; and Subramanian and Kawachi, 2003). These analyses are able to distinguish between different mechanisms through which income inequality might affect health. Hence, in a first step, we employ individual level data from the EVS to analyze the effect of income inequality on self-reported health. In a second step, we use country level data on life expectancy to estimate the effect of income inequality on a country's average level of health.

As already discussed in chapter 2, EVS is used to measure the social outcomes analyzed in this study. In particular, to examine the effect of income inequality on health, we rely on **self-reported health** information. More precisely, in the EVS, respondents are asked "*All in all, how would you describe your state of health these days? Would you say it is...*". Possible answers include very good, good, fair, poor and very poor. For our baseline specification, the dependent **health** indicator ranges from 1 to 5, with 1 measuring very poor health and 5 very good health.

Chart 5.1 displays the country average value of the population declaring to have good or very good health. It is apparent that the level of people perceiving to be in a good health status varies substantially across countries. In general, in most EU Member States over 50% of the population reports good or very good health scores. Highest shares of individuals reporting good or very good health, i.e. over 80%, are found in the Ireland, Denmark and Greece. Lowest levels of citizens reporting good or very good health levels, i.e. below 50%, are observed in Lithuania, Latvia, Estonia and Hungary.

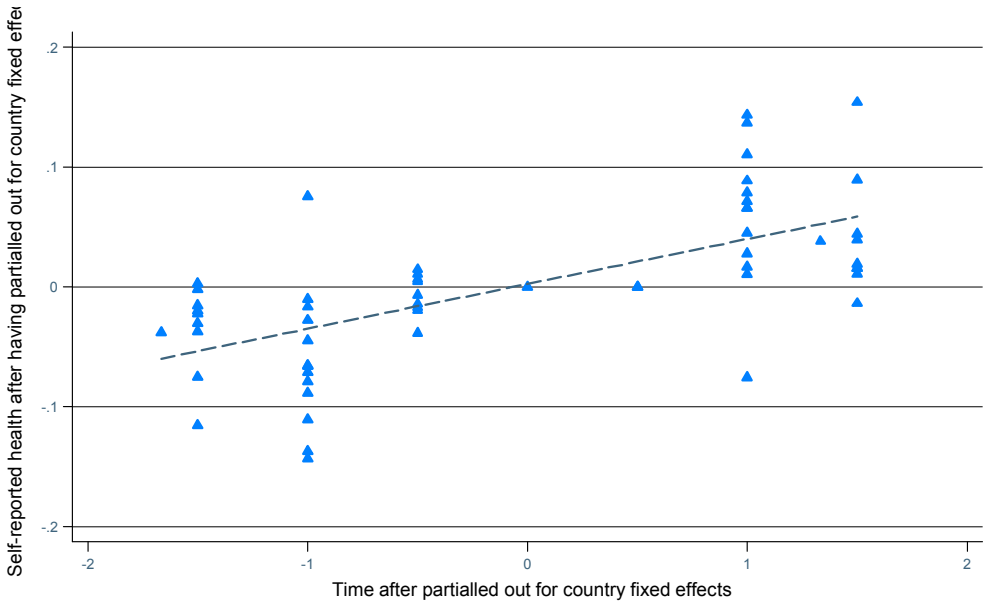
Chart 5.1: Share of the population reporting to have good or very good health



Source: European Values Studies, Waves 1981-1984, 1990-1993, 2008-2010
Notes: No information on self-reported health in the 1999-2001 EVS wave

Chart 5.2 and Table 5.2 give some information on the evolution over time in the level of self-reported health. Chart 5.2 shows the regression line when the country-wave specific level of health is fitted against a trend, and this, after having partialled out for the country fixed effects. Self-reported health, on average, has increased over the different waves of the European Values Survey. However, by looking at the Table 5.2, this average trend hides some country-specific trends. On the one hand, some countries have shown over time a marked increase in the share of the population with good or very good self-perceived health status, such as in the Czech Republic from 52% (1990-1993) to 68% (2008-2010). On the other hand, other countries have registered a drop in the share of population with good or very good self-perceived health status; for instance in the UK this share decreased from 78% (1981-1984) to 76% (2008-2010).

Chart 5.2: Evolution over time in the share of the population reporting good or very good health.



OLS coefficient: 0.04**

Source: European Values Studies, Waves 1981-1984, 1990-1993, 2008-2010

Table 5.2: Evolution over time of the share of individuals with good/very good self-perceived health

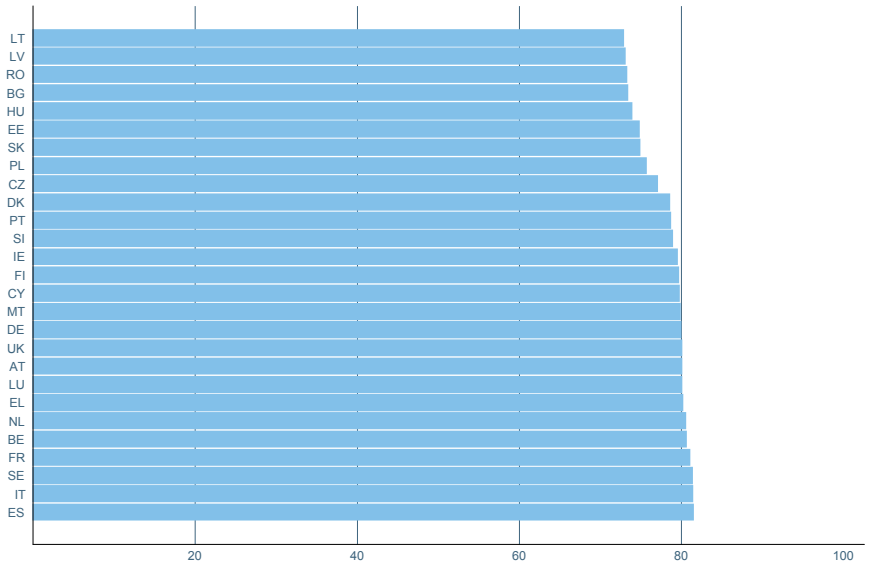
Country	1981-1984	1990-1993	2008-2010
Austria		65.68	79.7
Belgium	74.23	76.39	77.17
Bulgaria		54.94	56.8
Cyprus			77.52
Czech Republic		52.21	67.94
Denmark	81.19	82.35	83.09
Estonia		34.94	52.42
Finland		77.73	62.63
France	64.06	67.13	72.22
Germany	61.28	61.23	65.88
Greece			81.74
Hungary		34.1	56.08
Ireland	79.68	84.07	84.53
Italy	55.43	61.11	71.75
Latvia		33.8	45.54
Lithuania		44.75	51.3
Luxembourg			79.71
Netherlands	76.12	74.62	78.19
Poland		36.7	65.41
Portugal		47.19	60.52
Romania		48.31	57.32
Slovakia		51.34	54.68
Slovenia		41.45	68.51
Spain	51.51	58.71	78.06
Sweden	74.42		81.1
United Kingdom	77.88	78.98	76.29

Source: European Values Studies, Waves 1981-1984, 1990-1993, 2008-2010.
Notes: No information on self-reported health in the 1999-2001 EVS wave

Since self-reported health is a subjective measure of individuals' health status, we also used a more objective measure of health status in a population, i.e. life expectancy. Data on **life expectancy** is available from the WDI database (World Bank, 2013) for the period 1996 to 2009 and refers to the country-level life expectancy at birth in years.

Chart 5.3 displays life-expectancy in years for the most recent year (2009) by country. Lower levels of life-expectancy can be found in Eastern European countries, such as Latvia, Lithuania, Romania and Bulgaria. Highest levels of life expectancy, i.e. over 81 years, are present in Spain, France, Italy and Sweden.

Chart 5.3: Country-level life-expectancy (2009)



Source: Eurostat (2013a)

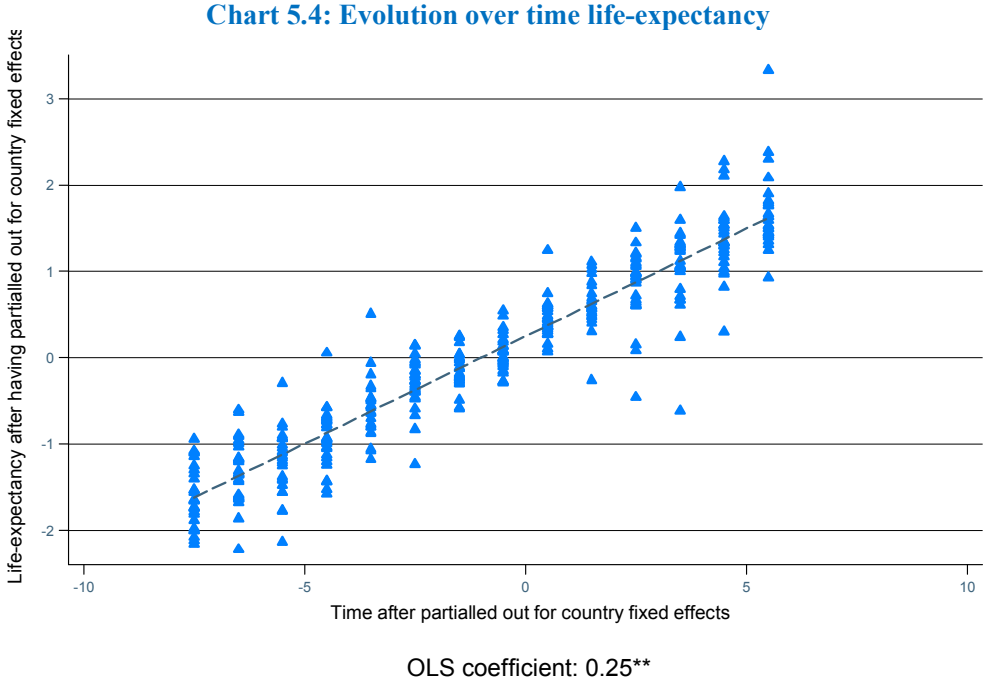
Chart 5.4 and Table 5.3 give some information on the evolution in the level of self-reported health between 1996 and 2009. Chart 5.4 shows the regression line when the country-wave specific level of health is fitted against a trend, once country fixed effects are taken into account. Life expectancy, on average, has increased between 1996 and 2009. As can be deduced from Table 5.3, this positive trend seems to be true throughout Europe. Depending on the initial life expectancy in 1996, countries have seen increases in the life-expectancy by as few as 2.1 years (for Cyprus) or as many as 4.9 years (Estonia).

Table 5.3: Evolution over time of life-expectancy

country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AT	76.98	77.39	77.57	77.78	78.03	78.53	78.68	78.63	79.18	79.33	79.83	79.98	80.23	80.08
BE	76.92	77.22	77.87	78.07	78.17	78.47	78.58	78.73	78.88	79.33	79.78	80.23	80.43	80.63
BG	70.90	70.35	71.06	71.41	71.66	71.77	71.87	72.07	72.56	72.56	72.61	72.66	72.96	73.41
CY	77.59	77.81	78.04	78.26	78.48	78.69	78.88	79.05	79.20	79.33	79.45	79.56	79.66	79.77
CZ	73.71	73.82	74.51	74.67	74.97	75.17	75.22	75.17	75.72	75.92	76.52	76.72	76.98	77.08
DE	76.67	77.07	77.48	77.73	77.93	78.33	78.23	78.38	78.68	78.93	79.13	79.53	79.74	79.94
DK	75.59	75.95	76.14	76.34	76.59	76.79	76.90	77.14	77.49	77.84	78.10	78.20	78.45	78.60
EE	69.84	70.19	69.36	70.06	70.42	70.26	70.90	71.32	71.91	72.57	72.69	72.81	73.77	74.82
EL	77.69	78.14	77.84	77.99	77.89	78.39	78.64	78.84	79.04	79.24	79.44	79.44	79.94	80.19
ES	78.12	78.60	78.67	78.72	78.97	79.37	79.57	79.62	79.87	80.17	80.82	80.82	81.88	81.53
FI	76.69	76.88	77.09	77.29	77.47	77.97	78.12	78.37	78.71	78.82	79.21	79.26	79.57	79.72
FR	78.00	78.36	78.46	78.61	78.96	79.06	79.26	79.26	80.16	80.11	80.51	80.81	80.87	81.07
HU	70.33	70.70	70.56	70.68	71.25	72.25	72.35	72.30	72.65	72.65	73.10	73.15	73.70	73.90
IE	75.79	75.97	76.20	76.07	76.54	77.14	77.64	77.92	78.20	78.48	78.76	79.04	79.14	79.50
IT	78.33	78.63	78.43	78.83	79.43	79.83	79.98	79.93	80.73	80.58	81.13	81.29	81.23	81.44
LT	70.11	70.91	71.22	71.57	72.02	71.66	71.76	72.06	71.96	71.25	71.06	70.90	71.81	72.91
LU	76.52	76.88	77.02	77.77	77.87	77.82	78.20	78.58	78.96	79.33	79.71	80.09	80.09	80.09
LV	68.78	69.35	69.01	69.74	70.31	70.76	70.96	71.27	72.03	71.36	70.87	71.02	72.42	73.08
MT	77.29	77.44	77.18	77.15	78.20	78.44	78.09	78.35	78.55	79.50	78.55	79.44	79.43	79.90
NL	77.44	77.79	77.88	77.84	77.99	78.19	78.29	78.49	79.10	79.35	79.70	80.10	80.25	80.55
PL	72.25	72.65	73.00	73.04	73.75	74.20	74.50	74.60	74.85	75.00	75.14	75.24	75.54	75.70
PT	75.01	75.41	75.71	75.96	76.31	76.81	77.07	77.22	77.67	78.07	78.42	78.32	78.52	78.73
RO	69.10	69.00	69.81	70.51	71.16	71.16	71.01	71.31	71.59	71.88	72.16	72.57	72.57	73.31
SE	78.96	79.20	79.34	79.44	79.64	79.80	79.85	80.10	80.50	80.55	80.75	80.90	81.10	81.35
SI	74.43	74.72	74.81	75.01	75.41	75.76	76.01	76.86	77.21	77.61	78.09	78.56	78.77	78.97
SK	72.65	72.70	72.55	72.90	73.05	73.40	73.60	73.60	73.96	73.90	74.20	74.21	74.70	74.91
UK	77.09	77.21	77.19	77.39	77.74	77.99	78.14	78.45	78.75	79.05	79.25	79.45	79.60	80.05

Source: Eurostat (2013a)

Chart 5.4: Evolution over time life-expectancy



Source: Eurostat (2013a)

5.3.2 Operationalization of the empirical study 1: income inequality and self-reported health

We investigate the effect of income inequality on self-reported health by estimating models of the form:

$$Health_{ict} = \alpha + \beta INEQUALITY_{ct-2} + \delta X_{ict} + \gamma W_{ct-2} + C_c + \tau_t + B_{ct} + \varepsilon_{ict} \qquad (5.1)$$

where $Health_{ict}$ is the self-reported measure of health for individual i, residing in country c, at time t. As a measure of inequality, we use the Gini coefficient. X_{ict} is a vector of individual and household specific explanatory variables, while W_{ct-2} represents the country level variables lagged by two years, and τ_t and C_c are respectively the linear trend and country dummies. Finally, B_{ct} are the break dummies to account for the measurement issues in the Gini coefficient and ε_{ict} is the idiosyncratic error for individual i at time t residing in country c. $INEQUALITY_{ct-2}$, corresponds to the GINI measure 2 years before the EVS survey takes place in a *given* country. Given that in this chapter we use 3 different waves of the EVS, this implies that for each country, we cover between 1 and 3 different periods, spanning from the beginning of the 1980s to 2010, depending on the number of EVS waves to which the country participated (see Table 5.2).

The reason for including a lagged Gini variable and lagged country level variable is as follows. Including a lagged structure of the variable allows us to account for delayed effects of the explanatory variables on health and to reduce the potential bias driven by reverse causation. However, the scholarly debate did not reach a consensus yet on which time lag is most appropriate to use when studying the effect of inequality on health. The appropriate lag structure hinges on the mechanism underlying the association between income inequality and health. For example rising income inequality might harm an individual's health outcome in the long-run through its effect on increasing the stress of managing professional and personal life. On the contrary, if income inequality exacerbates crime and homicide rates then the effect on health can occur in the short-run (Leigh and Jencks, 2007). To check the robustness of our analysis, we also report results when using the contemporaneous Gini variable as well as the 3 year lag (see Table 5.5 and Table 5.8).

We test the validity of the absolute income hypothesis, i.e. an individual's absolute income affects health status, by including in X_{ict} a measure of an *individual's income.* In addition we include a conventionally used set of covariates to account for individual level characteristics, i.e. *age, sex, educational background, information on occupational status, marital status, being religious, and number of children* (Hildebrand and Van Kerm, 2009; Gerdtham and Johannesson, 2004; and Mellor and Milyo, 2002).[27]

In the present analysis we also account for some important country-specific characteristics related to the country health system. In particular, it is reasonable to assume that a population's health status might depend on health expenditure. Data on a country's total health expenditure per capita in Dollar PPP is available from the OECD (2012). For convenience we transform the variable in logarithmic form and denote it by **health expenditure**. As additional country level variables W_{ct-2} , we consider the age distribution in the population by using the variable **dependents**. This variable measures the proportion of people aged 0-15 and 65+ over the 15-64 year-old population. Last, we include a measure for the population size per country, i.e. population. The information on population is transformed in lognormal form. A precise description of all individual level and country level variables can be found in Table 5.4. In addition, correlations between individual

[27] Beyond these important individual characteristics, scholars have also included control variables on ethnic identity, health care coverage and health behavior, such as exercise, diet, and smoking behavior, in their estimations (Mellor and Milyo, 2002). Due to data limitation of the EVS, we are however neither able to account for the origin of the individual nor for his health behavior.

level variables and country level variables are displayed in Tables A.2-3 in Appendix. The final sample used in Table 5.5 is depicted in Appendix, Table A.1.[28]

Table 5.4 Description of Variables

	Description	Source
Outcome Variables		
Self-reported health	Variable equal to 1-5, with higher values representing better self-reported health	EVS
Poor health	Variable equal to one if the respondent replies that he/she has poor or very poor health, 0 otherwise	EVS
Country level variables		
Gini	Gini coefficient (see chapter 2)	WIID/EUROSTAT
Health expenditure	Total health expenditure per capita in Dollar PPP, in logs	OECD (2012)
Dependents	Ratio of people younger than 15 or older than 64 to the working-age population, i.e. those aged 15-64 years.	World Bank (2013)
Population	Total population, in logs	World Bank (2013)
Individual level variables		
Male	Variable equal to one if respondent is male, 0 if female	EVS
Age	Age of the respondent	EVS
Age squared	Age squared of the respondent	EVS
Unemployed	Variable equal to one if the respondent is unemployed, 0 otherwise	EVS
Retired	Variable equal to one if the respondent is retired 0 otherwise	EVS
Married/Cohabiting	Variable equal to one if the respondents is married or cohabits with someone at the moment of the interview	EVS
Education >=19	Variable equal to one if the respondent completed education when he was 19 years old or more,	EVS
Childless	Dummy variable equal to one if the respondent has children, 0 otherwise	EVS
Religious	Variable equal to one if respondent declares to be a religious person, 0 otherwise	EVS
Low income	Dummy variable equal to one if the respondent declares to have a low income, 0 otherwise	EVS
High income	Dummy variable equal to one if the respondent declares to have a high income, 0 otherwise	EVS

[28] Notice that it has been argued that the relative financial position of individuals affects their health status, i.e. the relative income hypothesis. To test this hypothesis, scholars have used the mean income of the respective reference group (Deaton, 2003; and Deaton and Paxson, 2004). However, the construction of the reference group varies, with scholars using geographical proximity (Hildebrand and Van Kerm, 2009; and Gerdtham and Johannesson, 2004) or occupational group. In this analysis, we cannot derive the mean income of a reference group based on occupational and geographical related factors as this would require detailed income data for the reference group and the EVS does not provide such information. The only available data in the EVS on an individual's income categorizes individuals into three income categories, i.e. low, medium and high income, and hence does not exhibit enough variability to compute the reference group income. Being income inequality measured at the national level, it intuitively implies that the reference group corresponds to the whole population. While the use of a country-level inequality variable might be limited with respect to other studies, this disadvantage is compensated by the longitudinal form of the income inequality indicator. More precisely, we are able to test for delayed responses of income inequality on health outcomes while studies including the mean income of the reference group only consider the contemporaneous effect of income inequality on health (a notable exception is Hildebrand and Van Kerm, 2009). We believe that this constitutes an improvement with respect to former studies.

Note: Wave, break and country dummies are also included in all estimates.

5.3.3 Econometric results 1: income inequality and self-reported health

Estimation results for the effect of income inequality on self-reported health are displayed in Table 5.5. Linear regressions are used for estimating models 1-5. We start with a baseline estimation, which only includes the Gini variable as the main explanatory variable, as well as a linear trend, break dummies and country dummies. This model is presented in column 1 of Table 5.5. Column 2 includes individual-level variables, while column 3 also considers macroeconomics variables. In addition, a series of robustness checks are reported in columns 4-7. In particular, we re-estimate model 3 by using the contemporaneous Gini variable and the 3 year lag of the Gini coefficient instead of the 2 year lag (columns 4 and 5 respectively). Next, we check whether our results are robust to a different operationalization of the dependent variable. While in the estimations 1-5 we employ the 5-score health variable, estimation results in columns 6-7, the dependent variable is a binary variable which is equal to 1 if respondents declare to have very poor or poor health and 0 otherwise. In these cases, we apply a maximum likelihood estimator which account for the nonlinear relationship between the dependent and explanatory variables, namely the probit model. A two-year and a three-year lag are used in models 6 and 7 respectively. Note that Huber-White standard errors clustered at the country level are used throughout the aforementioned estimations. These standard errors are robust to arbitrary forms of error correlation within a country.

The most important conclusion reached from the estimation results presented in Table 5.5 is that once we control for individual and macroeconomic variables, in none of the regressions does the Gini coefficient turn significant. This suggests that income inequality is not significantly related to self-reported health. This result holds irrespective of the lag structure used for the Gini index, i.e. no lag, 2 and 3 year lag, and the hypothesized functional form of the model.

On the other hand, the individual level variables are significantly different from zero and with the expected sign. In particular, older individuals have a lower self-reported health status (or a higher probability of having reported very poor or poor health, in estimations 6 and 7) and the negative effect of age decreases with increasing age (as can be seen by the significant age squared variable). Moreover, men have a higher self-reported health status (or lower probability for poor health). In

addition, more educated people have higher levels of self-reported health (or lower probability for poor health). For individuals who are either unemployed or retired the estimation results suggest that health statuses are lower compared to the omitted group (employed). Next, we find that our results support the absolute income hypothesis, i.e. a significant effect of individual income on self-reported health. In particular, compared to medium income (i.e. the omitted category), individual with low income are associated with lower self-reported health, whereas high income earners exhibit better self-reported health outcomes. Being a religious person does not affect self-reported health when measured on a 1-5 scale, but turns significantly positive for the binary dependent variable. In addition, there seems to be a positive effect of being in a stable partnership and having children. In particular, individuals who are either married or cohabitate and/or have children seem to have higher levels of health (or lower probability of having poor health).

Now turning to the country-level variables, our estimations suggest that there might be a significant relationship between public health expenditure and self-reported health. More precisely, when using a three year lag, higher spending on health seems to increase self-reported health (and decrease the probability of having poor health, see columns 4 and 6). In addition, the size of the population is negative and significant. Last, the dependency ratio remains largely insignificant throughout the estimations. Note that a further robustness check, where population is excluded from the estimation is reported in Table A.4 in the Appendix.[29]

[29] In contrast to estimations on happiness and social capital we do not include GDP per capita in the estimations on self-reported health, since GDP per capita is highly correlated with health expenditure (correlation coefficient = 0.82) and when both variables are included in the estimation their coefficients cannot be estimated precisely, i.e. they both turn insignificant. However, the coefficient of the Gini coefficient remains unchanged to the inclusion of GDP per capita in the estimation (results not shown).

Table 5.5: Results for self-reported health

	Main specifications (columns 1-3)			Robustness checks (columns 4-7)			
				Lags of country-level variables			
	2-year	*2-year*	*2-year*	*No lag*	*3-year*	*2-year*	*3-year*
	(1) Baseline	(2) Adding individual characteristics	(3) Adding country-level variables	(4)	(5)	(6) DV: Poor health	(7) DV: Poor health
						Probit	*Probit*
Gini	0.02***	0.01***	-0.01	0.00	-0.02	-0.02	0.03
	(0.00)	(0.01)	(0.53)	(0.83)	(0.32)	(0.27)	(0.11)
Age		-0.04***	-0.04***	-0.04***	-0.04***	0.05***	0.05***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age squared		0.00***	0.00***	0.00***	0.00***	-0.00***	-0.00***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male		0.05***	0.05***	0.05***	0.05***	-0.07***	-0.07***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Education>=19		0.09***	0.09***	0.09***	0.09***	-0.14***	-0.15***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Unemployed		-0.16***	-0.16***	-0.16***	-0.16***	0.28***	0.28***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Retired		-0.20***	-0.20***	-0.20***	-0.20***	0.29***	0.28***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Low income		-0.18***	-0.18***	-0.18***	-0.18***	0.28***	0.28***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
High income		0.11***	0.11***	0.11***	0.11***	-0.21***	-0.21***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Religious		-0.01	-0.01	-0.01	-0.01	0.05*	0.05*
		(0.61)	(0.61)	(0.65)	(0.57)	(0.08)	(0.08)
Married/Cohabiting		0.05***	0.05***	0.05***	0.05***	-0.10***	-0.10***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Childless		-0.03*	-0.03*	-0.03*	-0.03*	0.03	0.03
		(0.09)	(0.09)	(0.08)	(0.09)	(0.25)	(0.26)
Health expenditure			0.46	0.05	0.75*	0.49	-0.82*
			(0.25)	(0.78)	(0.07)	(0.45)	(0.08)
Dependents			0.00	-0.00	0.01	-0.00	-0.02***
			(0.41)	(0.54)	(0.13)	(0.65)	(0.00)
Population			-1.89*	-1.13	-2.64**	-0.12	3.55**
			(0.09)	(0.25)	(0.04)	(0.94)	(0.02)
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Break Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	37188	37188	37188	37188	37188	37188	37188
R-squared	0.09	0.22	0.22	0.22	0.22	0.14	0.14

* p<0.10, ** p<0.05, *** p<0.01

Note: Cluster robust p-values at country level are reported in brackets. Country level variables take the same lag as the Gini variable.
In regressions (5) and (6) numbers show marginal effects or discrete change of dummy variables from 0 to 1; DV denotes dependent variable

5.3.4 Operationalization of the empirical study 2: income inequality and life expectancy

In contrast to the estimation of self-reported health of individuals, the study of life expectancy is operationalized at the country level and estimated as follows:

$$Life\ expectancy_{ct} = \alpha + \beta INEQUALITY_{ct-2} + \gamma W_{ct-2} + C_c + \varepsilon_{ct} \qquad (5.2)$$

where $Life\ expectancy_{ct}$ is the life expectancy in years for a country *c*, at time *t*. As a measure of inequality we use the Gini coefficient as well as the S80/S20 indicator, both drawn from Eurostat (2013a). As for the analysis on self-reported health, income inequality enters equation (5.2) with a two years lag. Furthermore, we include country level variables lagged 2 years (W_{ct-2}) and country fixed effects C_c in order to control for all time-invariant country heterogeneity. As for the other social outcomes, some robustness checks will be carried out to check the sensitivity of the findings to the assumptions underlying the model specification.

Note that in this estimation we do not include break dummies. This is due to the fact that the period covered is shorter (i.e. running from 1996 to 2006) than the one employed in the empirical analysis on the determinants of self-reported health. For the recent period, we can rely on consistent Gini and S80/S20 measures, readily available from Eurostat. Hence, we do not need to account for any breaks in the construction of the Gini variable.

As for the individual level analysis, to estimate the effect of income inequality on life expectancy it is necessary to control for other confounding factors. In the following we describe the explanatory variables used in the present exercise.

According to the absolute income hypothesis more wealthy countries are expected to attain higher health status than comparably poorer countries. To proxy a country's income, we use the log of GDP per capita measured in constant 2005 international dollars (PPP). We also include a measure of a country's expenditure on health. Data on a country's total health expenditure per capita in dollar PPP is available from the OECD (2012). The variable enters equation (5.2) in logarithmic form.

In addition, we make use of a wide range of additional variables to control for a country's economic and socio-demographic characteristics. In particular, we include an indicator of the educational level of the population in the country (gross school enrollment rate in tertiary education), an indicator of the female labor market participation (percentage of active women

aged 20-64), the age dependency ratio (proportion of people aged 0-15 and 65+ over the 15-64 year-old population), and a measure for the population size. A description of the variables included as well as their label can be found in Table 5.6.

Table 5.6: Description of Variables

	Description	Source
Outcome Variables		
Life expectancy	Country-level variable on life-expectancy at birth, total (years)	World Bank (2013)
Country level control variables		
Gini	Gini coefficient of equivalised disposable income	Eurostat (2013a)
S80/S20	S80/S20 income quintile share ratio	Eurostat (2013a)
GDP	GDP per capita in constant 2005 Intl. Dollar (PPP), in logs	World Bank (2013)
Health expenditure	Total health expenditure per capita in Dollar PPP, in logs	OECD (2012)
Tertiary education	Gross tertiary school enrollment in percent	World Bank (2013)
Female work	Percentage of women age 20-64 years that are active in the labor market	Eurostat (2013a)
Dependents	Ratio of people younger than 15 or older than 64 to the working-age population, i.e. those aged 15-64 years.	World Bank (2013)
Population	Total population, in logs	World Bank (2013)

Looking at the correlation matrix displayed in Table 5.7, we see that there are a number of high correlations between control variables, which might lead to distorted econometric findings. In particular, health expenditure and GDP are highly correlated (0.88). In addition, tertiary education is highly correlated with health expenditure (0.75) as well as correlated with GDP (0.4) and with the dependency ratio (0.4). Last, the dependency ratio is highly correlated with health expenditure (0.58). These high correlations suggest that the coefficients of the aforementioned variables might not be estimated precisely. Hence various robustness checks were carried out to ensure that the results for the Gini variable are not driven by multicollinearity issues (see Table 5.8 and Appendix, Table A.5).

Table 5.7: Correlation matrix

	Gini	S80s20	GDP	Health expenditure	Tertiary education	Female work	Dependents
Gini							
S80s20	0.9707						
GDP	-0.3091	-0.3642					
Health expenditure	-0.2945	-0.3656	0.8737				
Tertiary education	0.0349	0.0117	0.4082	0.7483			
Female work	-0.0676	-0.1345	0.0085	0.2885	0.4380		
Dependents	-0.0291	-0.0928	-0.1176	-0.5859	-0.4096	0.2083	
Population	0.1354	0.1448	0.0733	0.0014	0.2210	0.0385	-0.022

5.3.5 Econometric results 2: income inequality and life expectancy

Country-level estimates of the impact of income inequality on life expectancy are presented in Table 5.8. Model of column 1 only controls for the Gini variable and the country fixed effects. Subsequently, in estimations 2–7 we include additional country-level variables. Finally, columns 8-11 display some robustness checks with respect to (i) different measures of income inequality (9), (ii) different time lags for the country level variables and income inequality (10-11), and (iii) the exclusion of some highly correlated macroeconomic variables (8). Note that additional robustness checks are also displayed in Appendix, Table A5.

From Table 5.8, we can infer there is not a significant association between income inequality and life expectancy, and this independently of the indicator employed (Gini or S80/S20 ratio), and of the time lags used for the country-level variables (contemporaneous measures, 2 or 3 year lags). Indeed, although the Gini coefficient is positive and significantly different from zero in the first estimation (column 1), and then negative and significantly different from zero once we control for the GDP per capita (column 2), both findings seem to be spurious as the coefficient of the Gini index turns statistically insignificant when we control for other country-level variables (estimations 3-7).

The coefficient of GDP per capita is positive and significant in most estimations and provides some evidence that higher GDP per capita is associated with higher life expectancy. In addition, as expected, higher expenditure per capita on health is significantly associated with higher life expectancy throughout the estimations. The estimated coefficient for the variable female work suggests that higher participation of women in the labor market is positively and significantly associated with life expectancy. In addition, the share of dependents is positively and significantly associated with life expectancy. Last, the size of the population is

not significantly associated with life expectancy, unless inequality is measured by the contemporaneous Gini.

Table 5.8: Results for objective health measure: Life expectancy

	Main specifications (columns 2-7)						Robustness checks (columns 8-11)				
DV: Life-expectancy	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10) Gini_L3**	**(11) Contemporaneous Gini**
Gini	0.09**	-0.05*	-0.01	0.00	0.01	0.01	0.02	-0.00		0.00	0.03
	(0.02)	(0.08)	(0.76)	(0.95)	(0.76)	(0.45)	(0.45)	(0.77)		(0.83)	(0.16)
S80/S20									0.08		
									(0.21)		
GDP		5.63***	0.18	0.51	1.61**	2.29***	2.22**	1.55*	2.34***	1.45	4.05***
		(0.00)	(0.79)	(0.47)	(0.02)	(0.00)	(0.01)	(0.06)	(0.00)	(0.17)	(0.00)
Health expenditure			3.67***	3.77***	2.55***	2.70***	2.73***	2.48***	3.20***	3.01***	1.64***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Tertiary education				-0.01*	-0.01*	-0.01**	-0.01**		-0.02***	-0.01**	-0.00
				(0.06)	(0.08)	(0.01)	(0.01)		(0.00)	(0.03)	(0.71)
Female work					0.09***	0.07***	0.07***	0.09***	0.02	0.08***	0.06**
					(0.00)	(0.00)	(0.00)	(0.00)	(0.27)	(0.01)	(0.01)
Dependents						0.08*	0.08*	0.04	0.13***	0.04	0.12***
						(0.05)	(0.08)	(0.31)	(0.00)	(0.42)	(0.01)
Population							-0.35	-0.55	1.60	-2.36	5.11**
							(0.88)	(0.80)	(0.40)	(0.39)	(0.02)
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	174	174	139	129	129	129	129	139	187	110	149
R-squared	0.04	0.55	0.88	0.88	0.90	0.91	0.91	0.90	0.94	0.90	0.90
F-test	5.48	89.39	273.72	188.63	190.33	163.56	138.87	176.93	343.41	111.63	156.73
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

p-values in parentheses, * p<0.1, ** p<0.05, *** p<0.01
Country level variables take the same lag as the Gini variable.
DV denotes dependent variable

As aforementioned some of the time varying country level variables are collinear. In particular, health expenditure per capita and GDP per capita are highly correlated to each other (0.87), as well as the health expenditure per capita and tertiary education (0.74). In table A.5 in Appendix, we display the results obtained when only the health expenditure (column 1) or tertiary education (column 2) variable enter in equation (5.2) along with the GINI coefficient and the country fixed effects. The Gini coefficient remains insignificant throughout the estimations, which confirms the conclusions drawn from Table 5.8.

6. Conclusion

This report constitutes the third deliverable of a comprehensive series of studies initiated by the European Commission on the social and economic challenges associated with rising income inequalities. The present study provides a multivariate analysis of the effect of income inequality on three important social outcomes, i.e. health, social capital, and happiness. To arrive at a robust estimation of the effect of income inequality on these social outcomes, we have taken great care to construct a dataset that covers the greatest number of the EU member states and covers the longest possible time period. In addition, we employ a wide number of individual- and country-level control variables, and include a variety of robustness checks in our empirical estimations.

Our study suggests that the adverse effect of income inequality on a plurality of societal development challenges as proposed by Wilkinson and Pickett (2009) cannot be confirmed by the data, **with the important exception of trust**. In particular, our analysis **cannot confirm the hypothesis of a strong and significant effect of income inequality on health, happiness and participation in associational activities**. The result of no-effect of income inequality is robust to the inclusion of a large number of individual- and country-specific variables, different time lags of the inequality variable and different functional forms of the dependent variables. We believe that Wilkinson and Pickett's (2009) findings are largely driven by the omission of relevant country characteristics that are simultaneously correlated with income inequality and the social outcomes. When these country specificities are taken into account, the direct effect of income inequality on health, happiness, and associational activities vanishes.

At the same time the analysis carried out in this report suggests that **income inequality has a potential damaging effect on trust in Europe**. A negative association between income disparities and generalized trust is reported in all estimations presented in this report. Though these findings need to be considered with care given that they might be specific to the countries sampled and the time period covered, the implication of a significant effect of inequality on trust should not be discounted. According to a variety of scholars, **trust is critical for the functioning of societies** (Putnam, 2000). **Social capital and trust are linked to cooperative behaviors and investment decisions as well as to the quality of institutions**, all key factors of economic performance (Knack and Keefer, 1996, and Guiso et al 2004). The use of "public trust in politicians" as one of the variables considered in the

World Economic Forum Global Competitiveness Index (Schwab, 2010) also support the importance of trust in the economic sphere. According to Smith (1760, p.86), the perception of fairness is the "main pillar that upholds the whole edifice […] if it is removed, the great, the immense fabric of human society must in a moment crumble to atoms". **If this is true, then we should be worried about the consequences of combining both rising income inequality and lower trust.**

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APPENDIX A

Table A.1: Sample for self-reported health estimations, Table 5.5.

1981-1984	1990-1993	2008-2010
	Austria	Austria
		Belgium
	Czech Republic	Czech Republic
Germany	Germany	Germany
Denmark	Denmark	Denmark
		Estonia
	Spain	Spain
	Finland	Finland
France	France	France
		Greece
	Hungary	Hungary
Ireland	Ireland	Ireland
	Italy	Italy
		Luxembourg
Netherlands	Netherlands	Netherlands
	Poland	Poland
		Portugal
		Sweden
		Slovenia
		Slovakia
United Kingdom	United Kingdom	United Kingdom

Table A.2: Correlations between individual-level variables of Table 5.5.

	Age	Male	Education >=19	Unemployed	Retired	Low income	High income	Religious	Married/ Cohabiting
Male	-0.010								
Education>=19	-0.192	0.030							
Unemployed	-0.087	0.022	-0.041						
Retired	0.568	0.018	-0.129	-0.096					
Low income	0.119	-0.074	-0.137	0.155	0.182				
High income	-0.103	0.056	0.182	-0.108	-0.167	-0.438			
Religious	0.174	-0.123	-0.0584	-0.031	0.092	0.032	-0.071		
Married/Cohabiting	0.229	0.021	-0.1105	-0.095	0.016	-0.274	0.149	0.102	
Childless	-0.475	0.102	0.1816	0.070	-0.158	0.061	-0.013	-0.121	-0.520

Table A.3: Correlations between country-level variables of Table 5.5.

	Health expenditure	Dependents
Dependents	-0.004	
Population	-0.206	0.109

Table A.4: Results for self-reported health excluding Population

	Regression (3) of Table 5.5 excluding Population
Gini	0.01**
	(0.01)
Age	-0.04***
	(0.00)
Age squared	0.00***
	(0.00)
Male	0.05***
	(0.00)
Education>=19	0.09***
	(0.00)
Unemployed	-0.16***
	(0.00)
Retired	-0.20***
	(0.00)
Low income	-0.18***
	(0.00)
High income	0.11***
	(0.00)
Religious	-0.01
	(0.62)
Married/Cohabiting	0.05***
	(0.00)
Childless	-0.03*
	(0.09)
Health expenditure	-0.13
	(0.55)
Dependents	-0.00
	(0.32)
Time trends	Yes
Break Dummies	Yes
Country-FE	Yes
Number of observations	37188
R-squared	0.22

* p<0.10, ** p<0.05, *** p<0.01

Note: Cluster robust p-values at country level are reported in brackets
Country level variables take the same lag as the Gini variable.

Table A.5: Robustness-checks to Table 5.8

DV: Life-expectancy	(1)	(2)
Gini	-0.01	-0.05
	(0.75)	(0.15)
Health expenditure	3.74***	
	(0.00)	
Tertiary education		0.07***
		(0.00)
Country-FE	Yes	Yes
N	139	163
R-squared	0.88	0.39
F-test	413.87	42.92
Prob > F	0.00	0.00

p-values in parentheses, * p<0.1, ** p<0.05, *** p<0.01
Note: Country level variables take the same lag as the Gini variable.

Table A.6: Correlations between individual-level variables of Table 3.5.

	Age	Age squared	Unemployed	Self-Employed	Retired	Married/Cohabiting	Education 15-18	Education >=19	Childless dummy	Low income	High income	Religious	Big city
Age	1.000												
Age squared	0.988	1.000											
Unemployed	-0.028	-0.037	1.000										
Self-Employed	-0.199	-0.198	-0.719	1.000									
Retired	0.587	0.641	-0.015	-0.144	1.000								
Married/Cohabiting	-0.098	-0.100	0.062	-0.054	-0.113	1.000							
Education 15-18	0.136	0.158	0.037	-0.159	0.192	0.146	1.000						
Education >=19	-0.121	-0.138	-0.084	0.211	-0.173	-0.110	-0.446	1.000					
Childless dummy	-0.004	-0.003	0.005	0.019	0.008	0.017	-0.070	0.056	1.000				
Low income	0.136	0.136	-0.022	-0.063	0.092	-0.031	0.032	-0.056	-0.131	1.000			
High income	0.243	0.195	0.030	-0.096	0.023	-0.082	-0.242	0.142	0.035	0.092	1.000		
Religious	-0.477	-0.422	-0.067	0.176	-0.170	0.058	0.038	-0.001	0.094	-0.100	-0.521	1.000	
Big city	-0.050	-0.047	-0.062	0.118	-0.039	-0.016	-0.031	0.066	-0.006	-0.070	-0.081	0.089	1.000

Table A.7: Correlations between macroeconomic variables of Table 3.5.

	GINI	GDP per capita	Unemployment rate
GINI	1.000		
GDP per capita	-0.201	1.000	
Unemployment rate	0.292	-0.152	1.000

Table A.8: Correlations between individual-level variables of Table 3.6.

	Age	Age squared	Unemployed	Self-Employed	Retired	Married/Cohabiting	Education 15-18	Education >=19	Childless dummy	Low income	High income	Religious	Big city
Age	1.000												
Age squared	0.988	1.000											
Unemployed	-0.029	-0.037	1.000										
Self-Employed	-0.195	-0.194	-0.719	1.000									
Retired	0.589	0.643	-0.014	-0.144	1.000								
Married/Cohabiting	0.137	0.160	0.039	-0.159	0.195	1.000							
Education 15-18	-0.097	-0.099	0.061	-0.054	-0.114	0.147	1.000						
Education >=19	-0.124	-0.141	-0.084	0.211	-0.177	-0.448	-0.111	1.000					
Childless dummy	-0.006	-0.005	0.005	0.017	0.006	-0.071	0.018	0.056	1.000				
Low income	0.142	0.141	-0.024	-0.061	0.096	0.030	-0.030	-0.054	-0.132	1.000			
High income	0.237	0.189	0.030	-0.094	0.020	-0.245	-0.082	0.142	0.038	0.096	1.000		
Religious	-0.473	-0.418	-0.065	0.171	-0.167	0.039	0.058	0.001	0.094	-0.108	-0.515	1.000	
Big city	-0.044	-0.041	-0.065	0.117	-0.036	-0.029	-0.016	0.066	-0.005	-0.075	-0.076	0.082	1.000

Table A.9: Correlations between macroeconomic variables of Table 3.6.

	GINI	GDP per capita	Unemployment rate
GINI	1.000		
GDP per capita	-0.236	1.000	
Unemployment rate	0.290	-0.180	1.000

Table A.10: Correlations between individual-level variables of Table 4.4.

	Age	Age squared	Unemployed	Self-Employed	Retired	Married/Cohabiting	Education 15-18	Education >=19	Childless dummy	Low income	High income	Religious	Big city
Age	1.000												
Age squared	0.988	1.000											
Unemployed	-0.029	-0.037	1.000										
Self-Employed	-0.199	-0.198	-0.719	1.000									
Retired	-0.097	-0.100	0.061	-0.053	1.000								
Married/Cohabiting	0.588	0.642	-0.014	-0.145	-0.113	1.000							
Education 15-18	0.134	0.157	0.037	-0.159	0.145	0.192	1.000						
Education >=19	-0.121	-0.138	-0.084	0.211	-0.110	-0.173	-0.447	1.000					
Childless dummy	-0.004	-0.004	0.005	0.019	0.018	0.007	-0.070	0.055	1.000				
Low income	0.138	0.137	-0.022	-0.063	-0.031	0.093	0.031	-0.056	-0.132	1.000			
High income	0.246	0.198	0.032	-0.098	-0.082	0.024	-0.241	0.141	0.036	0.094	1.000		
Religious	-0.480	-0.426	-0.066	0.176	0.059	-0.171	0.040	-0.001	0.093	-0.102	-0.523	1.000	
Big city	-0.053	-0.049	-0.064	0.120	-0.016	-0.040	-0.030	0.065	-0.005	-0.070	-0.082	0.091	1.000

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Title: Multivariate analysis of the effect of income inequality on health, social capital, and happiness

Author(s): Beatrice d'Hombres, Leandro Elia, Anke Weber

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Abstract

The last two decades have seen a growing concern about rising inequality. In a recent book (2012), Economics Nobel laureate Joseph Stiglitz argues that rising income inequality is one of the main factors underlying the economic and financial crisis in the United States. Wilkinson and Pickett (2009) similarly assert that higher inequality has harmful social consequences. This trend of growing inequality has furthermore been condemned in public arenas, where protests in the United States (the "Occupy Wall Street" movement) and in Spain (the "indignados") show the extent of widespread public dissatisfaction with the present system which is denounced as being fundamentally flawed and unfair. The "We are the 99%" slogan and the associated web blog "We are the 99 percent" are direct references to this growing unequal distribution of wealth. A common rallying point of these movements is the argument that bankers who have benefited from large bonuses have been protected by bailout measures, while the victims of the crisis brought on by these very same bankers are faced with the reality of rising unemployment. This has also recently led the EU to agree on capping bonuses to bankers.

Within this context, the European Commission decided last year to undertake a comprehensive study on the social and economic challenges associated with rising income inequality in Europe. This report constitutes the third deliverable of this global study. The first report includes a literature review on the relationship between income inequality and social outcome variables in the areas of happiness, criminality, health, social capital, education, voting behavior and female labor participation (d'Hombres, Weber, & Elia, 2012). The second report complements the literature review by examining the bivariate correlations on NUTS1 level between income inequality and the social outcomes mentioned above (Elia, d'Hombres, Weber, & Saltelli, 2013). In this third report, we carry out a multivariate analysis on a selected number of social outcomes while controlling for a multitude of individual and country level specificities. The social outcomes are social capital, i.e. trust and participation in organizations, happiness and health.

This study suggests that the adverse effect of income inequality on a plurality of societal development challenges as proposed by Wilkinson and Pickett (2009) cannot be confirmed by the data, except for the case of trust. In particular, our analysis cannot confirm the hypothesis of a strong and significant effect of income inequality on health, happiness and participation in associational activities.

However, we show that income inequality has a potential damaging effect on trust in Europe. A negative association between income disparities and generalized trust is reported in all estimations presented in this report. Though these findings need to be considered with care given that they might be specific to the countries sampled or the time period covered, the implication of a significant effect of inequality on trust should not be discounted. According to a variety of scholars, trust is critical for the functioning of societies (Putnam, 2000). Social capital and trust are factors which are linked to cooperative behaviors and investment decisions as well as to the quality of institutions, which in turn are all key factors of economic performance (Knack and Keefer, 1996, and Guiso et al 2004).

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